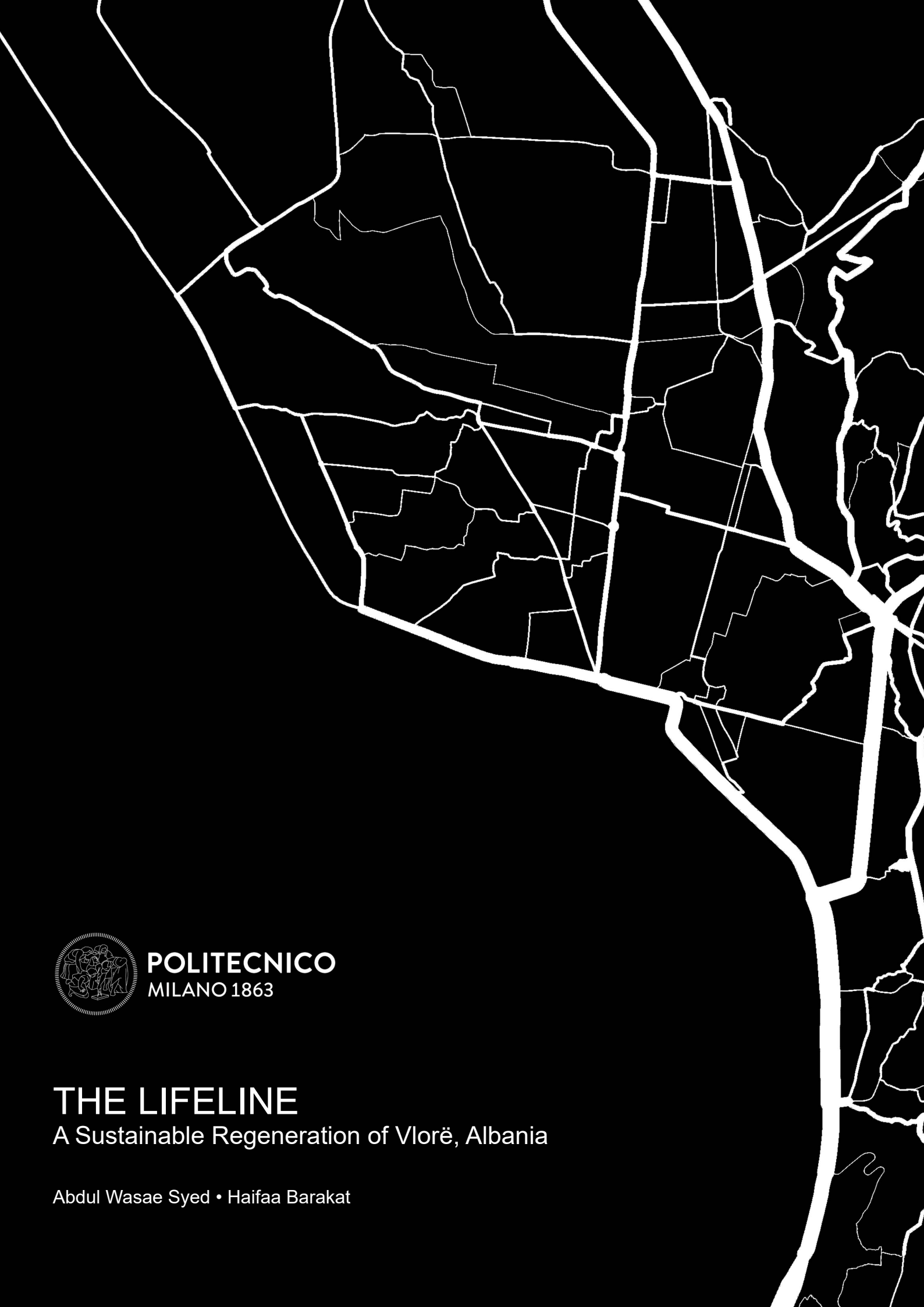


POLITECNICO
MILANO 1863

THE LIFELINE

A Sustainable Regeneration of Vlorë, Albania

Abdul Wasae Syed • Haifaa Barakat

POLITECNICO
MILANO 1863

A masters thesis submitted to the

School of Architecture, Urban Planning & Construction Engineering
Scuola di Architettura, Urbanistica e Ingegneria delle Costruzioni

Polo territoriale di Lecco

Politecnico di Milano

in partial fulfillment of the requirements for the degree of

Laurea Magistrale (Master of Science) in
Building and Architectural Engineering (LM-24)

Title

The Lifeline
A Sustainable Regeneration of Vlorë, Albania

Authors

Abdul Wasae Syed & Haifaa Barakat

Supervisor

Massimo Tadi

Co Supervisors

Gabriele Masera & Angela Colucci

April 2023
Lecco, Lombardy, Italy

ABSTRACT

The urban fabric of the city of Vlore, Albania is transforming at a rapid pace, with new development rising to meet the requirements of its community. The acceleration of urbanization has enormous potential for sustainable economic growth & improving the urban metabolism that caters to and for the community. The investment into infrastructure, tourism & social initiatives by collaboration of international stakeholders provides vital opportunities for promoting a circular economy. However, a multitude of issues recognized would need to be mitigated to ensure an integrated urban & ecological fabric.

The increased urbanization and economic growth of Vlore has added to the existing unbalanced distribution of services. The uncontrolled & unregulated construction activity has led to an urban sprawl that impacts the quality of open & green spaces impacting accessibility & connectivity. Green mobility dedicated infrastructure for walkability & biking is lacking and disconnected. The proposal and construction of the Vlore International Airport in the protected area of the Narte lagoon linking the new Vlore bypass highway adds to the complexity. The unbalanced integration of accessibility & connectivity of public transportation contributes towards the residents increased reliance on private transportation.

The pollution, deforestation & unregulated urban encroachment of the Soda Forest & Narta Lagoon disregards the natural & cultural sites of interest. Factors contributing to climate change are increasing due to unsustainable management & trade-offs. The poor waste management, landfills & discharge of sewage has severely contaminated soil & groundwater adversely impacting the endemic biodiversity also affecting the health & wellbeing of the community.

This dissertation employs the use of the Integrated Modification Methodology (IMM) in the primary stage to identify & analyze barriers and problems to the efficient growth & transformation of Vlore into a balanced urban metabolism that integrates the complex ecosystems to pursue a decarbonized & resilient regeneration.

The next stage involves developing the recognized sites into potential urban & architectural projects that harmonize resilience, sustainability, and technology that mitigate the problems identified in the primary stage. A total of five hubs with varied functionality were designed & recommended working along with active stakeholders, the two of the hubs which are in construction sanctioned by the Municipality of Vlore, Albania.

The penultimate stage deals with design and sustainable building technologies supported by intensive studies ranging from spatial layout, daylight and thermal analysis to support the recommended interventions and construction.

The final stage involves the analysis & study made by the retrofit analysis considering interventions & recommendations as studied & made in the earlier stages to summarize the possible improvement & integration of the urban and ecological fabric of Vlore.

Keywords

Integrated Modification Methodology; IMM; Urbanization; Accessibility; Connectivity; Resilience; Ecosystems; Sustainability; Metabolism; Integration; Decarbonization; Regeneration

SINOSSI (in Italiano)

Il tessuto urbano della città di Valona, in Albania, si sta trasformando ad un ritmo rapido, con un nuovo aumento dello sviluppo per soddisfare le esigenze della sua comunità. L'accelerazione dell'urbanizzazione ha un enorme potenziale per la crescita economica sostenibile e il miglioramento del metabolismo urbano che si rivolge, e per la comunità. L'investimento in infrastrutture, turismo e iniziative sociali da parte della collaborazione di parti internazionali involte, offre opportunità vitali per promuovere un'economia circolare. Tuttavia, una moltitudine di problemi riconosciuti dovrebbero essere mitigate per garantire un tessuto urbano ed ecologico integrato.

All'attuale sbilanciata distribuzione dei servizi si è aggiunta una maggiore urbanizzazione e crescita economica. L'attività di costruzione incontrollata e non regolamentata ha portato a un'espansione urbana incontrollata che ha un impatto sulla qualità degli spazi aperti e verdi, con un impatto su accessibilità e connettività. L'infrastruttura dedicata alla mobilità verde per la mobilità a piedi ed in bicicletta è carente e disconnessa. La proposta e la costruzione dell'aeroporto internazionale di Valona nell'area protetta della laguna di Narte, che collega la nuova tangenziale di Valona, aggiunge complessità. L'integrazione sbilanciata di accessibilità e connettività dei trasporti pubblici contribuisce a una maggiore dipendenza dei residenti al trasporto privato.

L'inquinamento, la deforestazione e l'invasione urbana non regolamentata della foresta di Soda e della laguna di Narta ignorano i siti naturali e culturali di interesse. I fattori che contribuiscono al cambiamento climatico sono in aumento a causa della gestione e dei compromessi non sostenibili. La cattiva gestione dei rifiuti, le discariche e lo scarico delle acque reflue hanno gravemente contaminato il suolo e le acque sotterranee, con un impatto negativo sulla biodiversità endemica, con conseguenze anche sulla salute e il benessere della comunità.

Questa tesi prende l'uso della Metodologia di Modifica Integrata (IMM) nella fase primaria per identificare e analizzare le barriere e i problemi alla crescita e alla trasformazione efficiente di Valona in un metabolismo urbano equilibrato che integri i complessi ecosistemi per perseguire una rigenerazione decarbonizzata e resiliente.

La fase successiva prevede lo sviluppo dei siti riconosciuti nei potenziali progetti urbani e architettonici che armonizzano la resilienza, sostenibilità e tecnologia che mitighino i problemi identificati nella fase primaria. Un totale di cinque hub con funzionalità diverse sono stati progettati e consigliati in collaborazione con le parti interessate attive, i due hub in costruzione sanzionati dal Comune di Valona, in Albania.

La penultima fase riguarda la progettazione e le tecnologie per l'edilizia sostenibile supportate da studi intensivi che vanno dalla disposizione spaziale, alla luce diurna e all'analisi termica per supportare gli interventi e la costruzione consigliata.

La fase finale prevede l'analisi e lo studio effettuati dall'analisi retrofit considerando gli interventi e le raccomandazioni studiati e realizzati nelle fasi precedenti per riassumere il possibile miglioramento ed integrazione del tessuto urbano ed ecologico di Valona.

ACKNOWLEDGEMENT

Our heartfelt gratitude to our beloved families whose unwavering love & support motivated us throughout the incredible journey of realizing this dissertation.

The insight from Prof. Massimo Tadi throughout the duration of the programme culminating to his critique as our supervisor was invaluable. We graciously thank him for his support which enabled us to seek and optimize solutions from diverse perspectives.

We extend our gratitude to our co-supervisor
Prof. Gabriele Masera as his expertise on building technologies blending with architectural thought was crucial into developing a sustainable project.

We would also like to thank Prof. Angela Colucci, our other co-supervisor who motivated us to pursue nature based solutions to optimize urban interventions and design as the dissertation reflects considerably in this regard.

We acknowledge the time and effort of many other experts including Mr. Carlo Andrea Braghi whose support was greatly appreciated in the earlier phases of the thesis.

A special thanks and acknowledgement to
Mr. Alessandro Salimei and Mr. Manuel Casteletti from CELIM, Italy whose support at the internship was greatly appreciated. We thank them and CELIM for the opportunity.

Finally, we would like to thank ourselves and eachother for the considerable input, knowledge and skills that made this dissertation a stepping stone in our careers.

these pages have been intentionally left blank

TABLE OF CONTENTS

1. INTRODUCTION

VLORË
1.1

VLORE

Vlorë, a major city in Albania is situated on the Bay of Vlorë along the Albanian Adriatic and Ionian Sea Coasts in the eastern part of the Strait of Otranto surrounded by the foothills of the Ceraunian Mountains. Vlorë falls under the periphery of the hot-summer Mediterranean climate zone with an average annual temperature of 16.9 °C (62.4 °F). Summers in Vlorë are dry and hot while winters experience moderate temperatures and changeable, rainy weather.

In ancient times the Northern part of the present region of Vlora was populated by an Illyrian tribe, while the Southern one was inhabited by the Epiriot tribe of Chaonians. At that time, the city of Vlora was called Aulona. It was renowned by many travellers as one of the main port cities of the southern Illyrian region, second only to Apolonia and Oricum.

The name, Vlora, is one of the few geographic names of Adriatic eastern coast that has remained unchanged since the ancient times. A relevant part of the population of these provinces was able to resist the process of Romanization and enslavement, which characterised a large part of the Balkans peninsula. According to archaeological remains found in the area, Vlora region was marked by significant prehistoric residences, cultural and economic settlements, cities and urban centres.

In the middle of the 14th century the aristocratic Delvina family ruled the town of Delvina and in 1354, Mehmet Ali Pasha Delvina was the owner of the castle and the city. In the 15th and 16th centuries the Ottoman regime turned Vlora into an important Adriatic Port. Vlora was the base for the Ottoman attacks against the southern Italian cities in 1480, against Himara insurgents in 1492 and served as a base for the Sultan Sulejmani against Corfu in 1537.

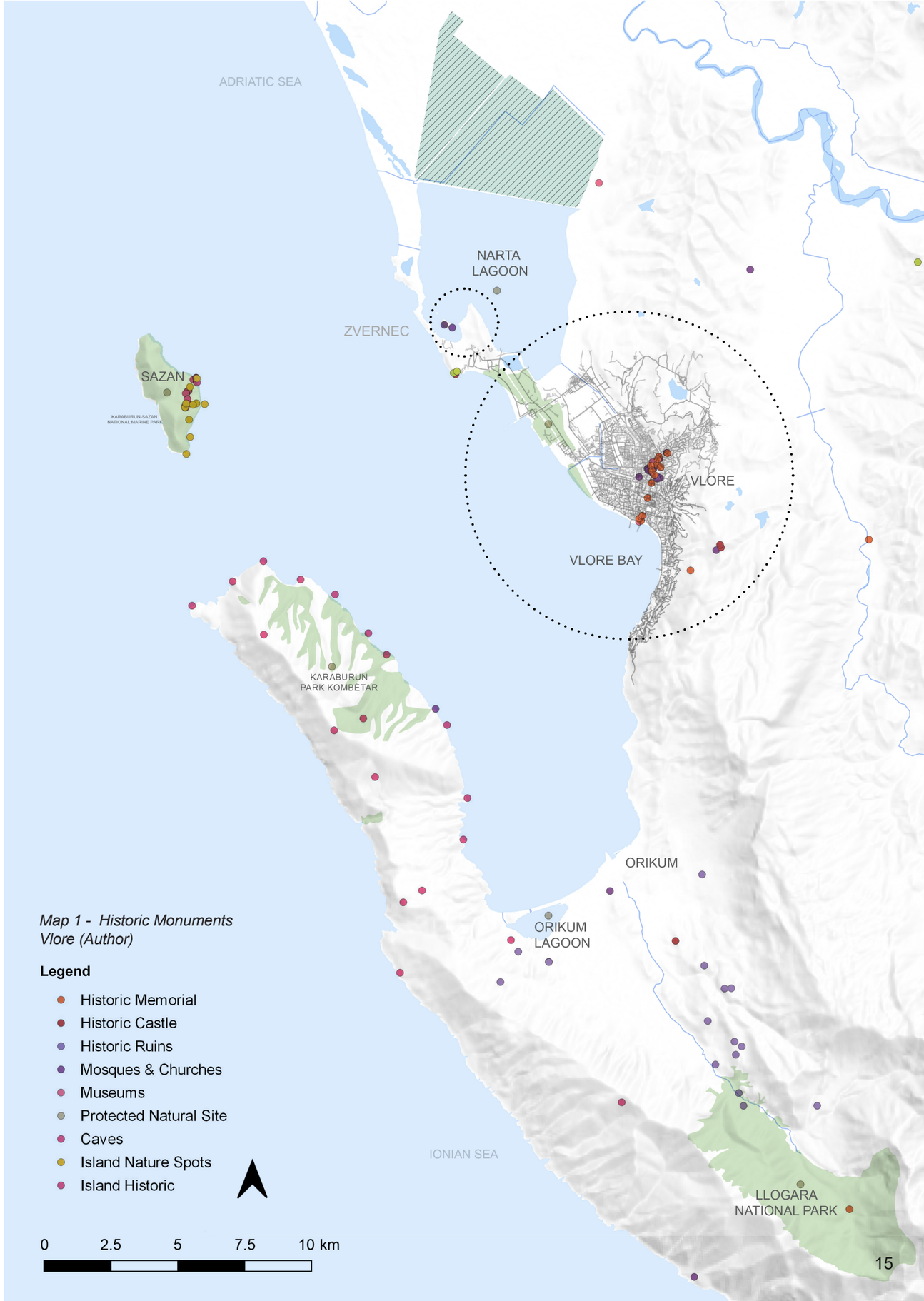
In the 17th and 18th centuries Vlora was one of the most important harbours of southern Albania due to the shape of its bay that protected boats from storms. A large depot was built in the port of Vlora for the storage of agricultural products and goods to be exported. The city developed trade with Trieste, Venice, Vienna, Corfu, Istanbul, Izmir, Brescia, Bari, Manastir, Ioanina and Malta. Vlora exported olive oil, olives, salt, wool and leather, as well as a many of other agricultural products from around the region.

Throughout the centuries Vlora has been known as one of the most patriotic areas of Albania. Struggles for freedom, independence and prosperity have been in the spirit of all people in the territory. Vlora region was the site of many wars against foreign occupations and struggles to spread Albanian education and was home to many patriotic societies.

The most important event in the city of Vlora happened on the November 28, 1912, when Ismail Qemali, together with other Albanian delegates from around the country, declared the Independence of Albania from the Ottoman invasion and raised the national flag in Vlora. Vlora became the first capital of the independent Albania.

In December 1914 the Italians conquered Vlora. After the expansion of the Italian occupation, a resistance to their rule started to grow. In 1920, after the Congress of Lushnja, the “National Protection Committee” was created. The Commettee organised war troops in the War of Vlora.

Description by Author. (Multiple Sources)



Map 1 - Historic Monuments Vlore (Author)

ISHULLI I ZVERNECIT
1.2

THE ISLAND OF ZVERNEC

Zvërnec is mentioned since the 17th century in the writings of foreign travellers. A significant testimony arrives from Evliya Çelebi, who in 1670 undertook a journey across the South of Albania. He observed that the main activities in the village were the production of salt and fishing. It seems that the inhabitants of Zvërnec used to pay a tribute to the Sublime Porte consisting of large amounts of salt produced there, instead of undergoing the usual taxation system. The salt was then exported to the whole of Europe (cit. in Dankoff & Elsie, 2000).

Vlora Region is a repository of interesting cultural traditions, which are the expression of a remarkable ethno-cultural area, called “Laberi”. These traditions can be found in many fields: architecture, folklore, music, handicraft, gastronomy, etc.

The Region maintains the tradition of Iso-Polyphony, classified by UNESCO in 2005 as a masterpiece of the oral and intangible heritage of humanity. Iso-polyphony is a sophisticated form of group singing, derived from Byzantine church music, and performed mostly by men. Nowadays, this tradition is adversely affected by poverty, absence of legal protection, lack of financial support for practitioners, and emigration of young people from rural areas.

The Region is also well known for its crafts, including traditional costumes of the different communes, handmade carpets and tapestries, woollen covers, knitting, embroidery, felt processing, work tools, and musical instruments. Traditionally, brides prepared their own handmade dowry and in some villages this tradition is still practised. For this reason in most village houses original and handmadetraditional costumes, carpets, and embroiderycan be found.

Figure 1 - The abandoned square in Zvernec. (Author)

Figure 2 - Handicrafts for sale. Courtesy: Celim

Figure 3 - A traditional folk dance performance. Courtesy: Celim

Figure 4 - Handmade carpets & tapestries for sale. Courtesy: Celim

Figure 5 - The salt plains of Narte in a period picture. (1935). [© MARKA Photo Agency]

Figure 6 - An interesting roof cornice with support strutsmade of nailed branches in a traditional building in Nartë.

Figure 7 - Local cheese in Zvernec.

Figure 8 - Olive Oil Production

Figure 9 - Fish Production

Figure 10 - Meat Production

Figure 11 - Wine & Liquors Production

Figure 12 - Bee & Honey Production

HISTORI DHE KULTURË
1.3

HISTORY AND CULTURE

The part of social life in which traditions are kept most alive is certainly religion. All the inhabitants of the village are Orthodox Christians and the church on the island is for them an undisputed point of reference. On August 15, when the Feast of the Dormition of Mary is celebrated, the faithful flock to the church on the island, not only from the surroundings, but also from other towns in the country. On the night preceding the feast, the inhabitants of the hill quarter descend in a procession toward the church.

The island still maintains a halo of sacredness, which is felt in the testimonies of the villagers. During the years of state atheism, when access to the island was forbidden, the inhabitants would gather to pray in silence on the threshing floor (lëma) of the hill quarter, located in a privileged spot facing the island, so as to maintain, at least visually, the spiritual bond with their church. Also during the rituals related to Easter (which here coincides with the beginning of the Carnival6) there was a large participation.

The monastery was abandoned during the Communist period in Albania but soon after the system's collapse, its important role in the community was restored. Named after St. Mary, every August 15th locals and others begin their pilgrimage to the monastery to celebrate the birthday of the woman who gave birth to Christ. Another female figure that has left her mark in Zvërnec is the one who embroidered the original flag of Albania's Independence in 1912. Her tomb is located in the island's cemetery.

The monastery is an impressive object of significant cultural and religious value. Its construction is thought to have occurred between the 12th and 13th centuries and, thus, boasts an architecture that is typical of the Byzantine era. To reach the monastery, you follow the charming bridge that, stretching over the water, connect the island with land.

Figure 13 - Island of Zvërnec
Courtesy: CELIM, Albania

Figure 14 - Monastery of Zvërnec
Courtesy: CELIM, Albania

Figure 15 - Island of Zvërnec as a stage for community events.
Courtesy: CELIM, Albania

Figure 16 - Pilgrims celebrating the Feast of the Dormition of Mary on the night of 14th August.
Courtesy:CELIM, Albania

THE MURADIE MOSQUE

The Muradie Mosque or Lead Mosque is located on the Ismail Qemali Boulevard. The mosque was built in 1537 by the famous Ottoman Turkish architect Mimar Sinan during the rulership of Sultan Suleiman the Magnificent. The mosque is located in downtown Vlora on a central square, surrounded on all four sides with roads. It is located on west of Sadik Zotaj, south of Lef Sallata and east of Papa Kristo Negovani streets

The structure consists of the main building and the minaret. The former is about 10 to 11 square meters while the minaret has a length of 18 metres. In the past, it also had a portico which has been destroyed later. The mosque has a dome with a supporting polygon raised base, arched windows and classical triangular forms topping the side walls.

The brick work of the Muradie mosque has layers with two different brick colors. There is also a contrast between the texture, quality, color, as well as size and sequence of the bricks used to build the Islamic prayer hall compared with the larger white chiseled stones used to build the minaret.

Figure 17 - Muradie Mosque (Author)

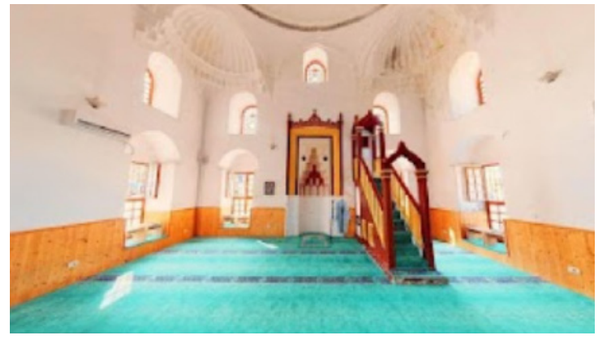


Figure 18 - Interior of the Muradie Mosque.

Figure 19 - Muradie Mosque on festive days.

ARKITEKTURA
1.4

ARCHITECTURE

Most of the historical buildingshave been demolished and rebuilt using modern materials and techniques, or else have undergone major alterations, which have completely changed their original appearance.

In traditional buildings, load-bearing walls are in three-leaf stone masonry and have an average thickness of 60-70 cm. The external leaves are made up of uncoursed rubble stones. Gaps between stones are filled with smaller stones and copious quantities of mud mortar. In more recent maintenance works, joints have been repointed with lime mortar. The inner leaf is of smaller pieces of stone and earth.

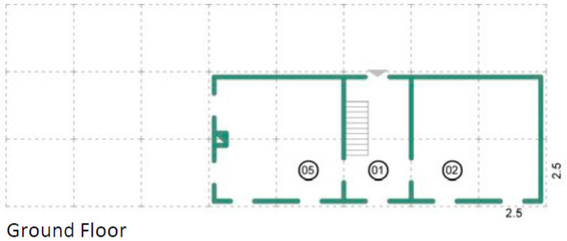
Inside the wall, there are timber tie beams repeated at regular intervals in height (approximately every 60 cm). This technique was found during the surveys also in the nearby village of Nartë, both in residential buildings and in some chapels. The analysis of the buildings revealed a greater care in the execution of corners, for which squared off blocks that are slightly larger than those of the walls were used.

Opening are small and lintels are generally in timber. Intermediate floors are also in timber. Directly above the beams, wooden boarding serving as paving is placed. In semi-basements, which are used as storerooms or stables, the paving is in rammed earth or in concrete screed.

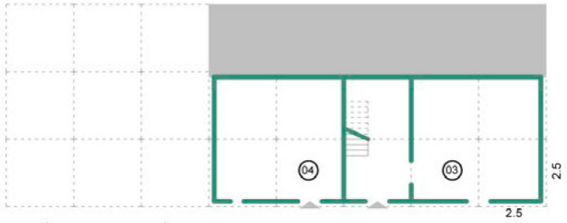
Bedrooms and living rooms often have false ceilings made with wooden planks. Roofs are hipped and have a timber structure consisting of trusses with a king post. Above the trusses are joists on which a wooden boarding is placed. The roof covering is made of brick tiles. The roof pitches are slightly protruding (approximately 10 cm) from the walls by way of jutting bent tiles.

The city of Vlore now relies heavily on reinforced concrete as the main building material and adopts a commercial outlook of construction techqniques.

Original layout

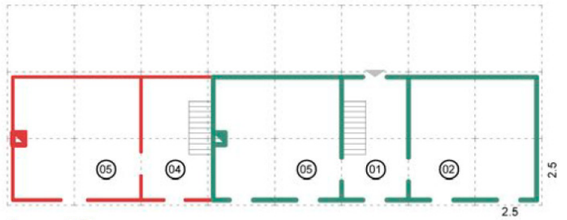


Ground Floor

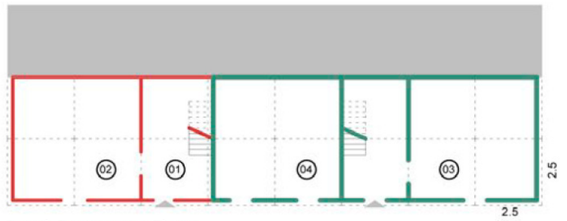


Semi-Basement Floor

Transformed layout



Ground Floor



Semi-Basement Floor

1. Entrance
2. Bedroom
3. Harvest Storeroom
4. Stables and Troughs
5. Hearth Room

Figure 20 - Architectural Layouts . (The Coastal Village of Zvernec)

Figure 21 - Remains of a traditional dwelling in the hill quarter with horizontal reinforcing timber elements. (Author)

Figure 22 - The abandoned square in the neighbourhood. (Author)

Figure 23 - An interesting roof cornice with support struts made of nailed branches in a traditional building. (CELIM, Albania)

Figure 24 - Ismail Qemali Boulevard, Vlore. Reinforced concrete construction now dominates the urban city center. (Author)

Figure 25 - The Waterfront, Vlore.

TURIZMI
1.5

TOURISM IN VLORE

Tourist arrival in Vlora has mostly seasonal pattern. According to the data available collected from the questionnaires, it is seen that 62 per cent of the tourist businesses operate during the four peakmonths, beginning June and including July, August and up to September. Only 38 per cent of the operators declare that their activity is extended throughout the year.This is related to the domination of the sea tourism, whose inputs can be used only in the summer season.Regardless of the activity concentration in peak season, the majority of the accommodation structures are opened all over the year. But, during the other months of the year, hospitality is not their main activity, the number of tourists and the occupancy rates for hotels are very low during the off seasons; they offer restaurant and bar services used mostly by the residents.

- The quality and variety of natural landscapes
- Cultural landscapes created by people
- Historical places and cultural heritage
- Biodiversity – flora and fauna, marine and land
- The distinctive features of local living

1. The ancient city of Orikum,
2. The ancient settlements of Radhima & Dukat
3. The Pashaliman port,
4. Archaeological park of Orikum,
5. Ethnographic museum,
6. Museum of Independence,
7. Dervish Aliu Castle,
8. Marmiroi church,
9. Sofe's castle,
10. Gjon Bocari's castle
11. Cave of Haxhi Ali,
12. Cave of DukGjoni,
13. Izvor planes,
14. Man plane of Tragjas,
15. Orikum Laguna,
16. Shen Vasili beach,
17. Shen Jani beach,
18. Grama Bay,
19. Zhapoveli Bay,
20. Brisani Bay,
21. Flag Pine.

Karaburuni area and Vlora bay, as a broader area where are well known for their cultural and historical values.Historical and archaeological values of the area are unique and are very relevant for tourism, including diving. Grama bay is a former famous harbour since antiquity and on the rocks there are abundant inscriptions in old Greek and Latin languages. Cave of Haxhi Ali in Karaburuni is also an important site that attracts the visitors.

26% of the tourism operators whose basic activity is accommodation (bar, restaurant, hotel) offer also nature-based activities related to the MPA, and this trend is going to be higher, because other 54% of those who do not offer these activities are planning for the future to develop them, especially in Karaburun-Sazan area. 32% of operators develop nature based activities at the area of Karaburun-Sazan Park, and see this kind of activities very important for the future development of this area, especially for sustainable tourism development.

The tourism sector in the Vlora Region, but also in all of Albania, is new in terms of experience. Its chaotic development reflects the evolving entrepreneurial mentality, the lack of vision of governments to design and implement strategies aimed at creating a sustainable sector, and the apathy of local institutions. A mindset that raises barriers instead of communication channels and cooperation between stakeholders, and that is evident by the lack of coordination of local government work with business operators, the lack of support for the sector and the lack of recognition of opportunities created today by donors and various organizations.

Vlora Region has two visitor centres: Llogara, Rradhime and Saranda has one: Syri i Kalter.

Map 2 - Tourism in Vlore (Author)

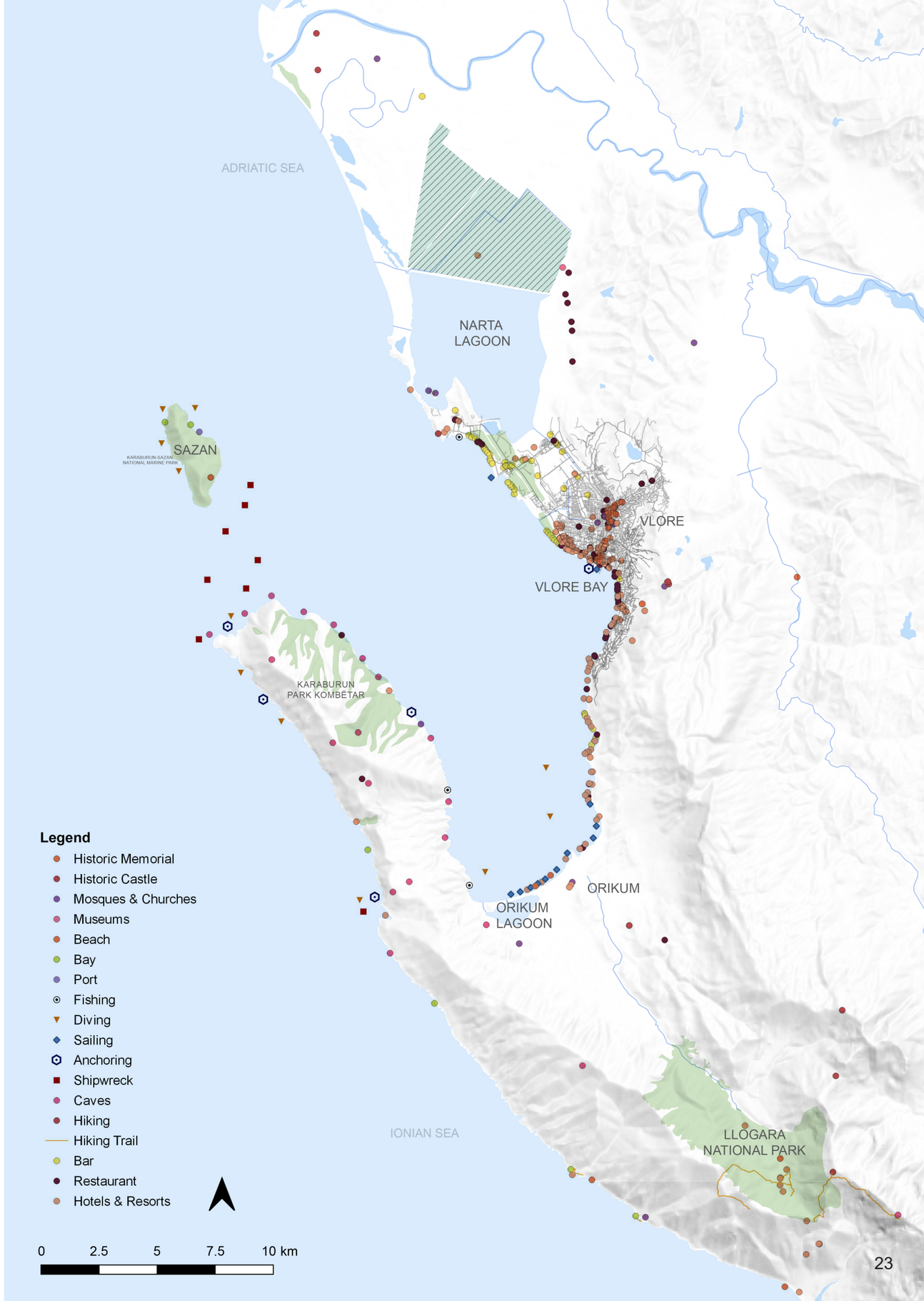


Figure 26 - Ancient Theatre in Oricum Archaeological Park

Figure 27 - Dervish Aliu Castle

Figure 28 - Cave of Haxhi Ali

Figure 29 - Shen Jani beach

Sources:

Economic Value of the Commercial Nature–Based Tourism Industry in British Columbia, Tourism British Columbia Canada Research Services, 2004
Ecotourism, principles and practices, Ralf Buckley, 2009
Characteristics of the commercial Nature-Based Tourism Industry in British Columbia, Tourism British Columbia Research Services, Wilderness Tourism Association, 2005
Nature-Based tourism enterprises – Guidelines for success, Storm Thurmond Institute, 2000
INSTAT Hotels and their capacity, 1995-2010
Economic Impact of Travel & Tourism in Albania, the report of World Travel & Tourism Council; 2015
Paul F. J. Eagles, et al Sustainable Tourism in Protected Areas Guidelines for Planning and Management. IUCN (2002)
INSTAT Census, 2011
United Nations Albania, Tourism development international, Albania Culture Marketing Strategy. MDG
achievement found; June 2010
UNDP Art Gold 2 Albania Programme, June 2011. Strategic Plan of Vlora region: "The Zero Emissions Territory". Final Document;
Compendium of Tourism Statistics of UNWTO 2007-2011;
Qosja, Ermira & Licaj, Brunilda & Mbrica, Ani & Braholii, Aurela. (2022). Analysis on the tourist offer of the Vlora Region, from the viewpoint of tourism stakeholders 1.
Tilot V., Jeudy de Grissac A. (1994) Diagnostic of the marine and coastal environment of northern and southern
Albania. Dobbin Milus International and The priority Actions Programme of United Nations Environmental
Plan/Mediterranean Action Plan (UNEP-MAP),
UNDP/GEF and Ministry of Environment (2005a) Management Plan Complex: LLogora-Rrëza eKanalit-DukatOrikum-Tragjas-Radhimë-Karaburun. GEF UNDP-Conservation of Wetland and Coastal Ecosystems in Mediterranean Region Project. Ed. Albania. Final Draft. Ed. MedWetCoast (in English and Albanian)

2. ECOSYSTEMS

LUMI VJOSA

2.1

THE VJOSA RIVER

The Aoos-Vjosa River runs for 272 km from its sources in Greece to its mouth in southern Albania, where it drains into the Adriatic Sea. Thefirst 80 km are in Greece. The total catchment area covers 6,704 km2, of which 4,365 km2 lies in Albanian territory.

The Vjosa River and its tributaries can be classified as a gravel-dominated, laterally active, anabranch rivers with high sediment yields, where the bedload supply is higher than the actual transport capacity of the channel. This is reflected, particularly in the middle section of the river, in extensive gravel plains up to 2,000 m wide, crossed by several lateral and parallel rovers, oxbows and side channels.

Another criterion of laterally active, anabranch gravel bars are specific forms of break-off at high flow velocities, which is reflected in the rapid abandonment of the main river channel during extreme flood events, and the formation of a new, parallel river channels in former floodplains.

CONSTRAINED SECTION

The upper section of the Vjosa River is characterised by a steeper slope of the watershed and a succession of steep gorges between the settlements Permet, Kelcyra, and Dragot, interspersed with areas of large alluvial fans and islands. Downstream of the Dragot town area, the river valley widens, with the exception of two gorges in the river course: Kalivaci and Pocemi.

BRAIDED SECTION

The middle section of the river, between the towns Selenice and Tepelena, is a typical river floodplain. The middle section is known for the large gravel and sand banks formed by the branching river. The valley is wide, and the floodplains of Vjosa River are recognised as one of the most magnificent riparian ecosystems of the Balkan Peninsula, characterised by their natural, dynamic hydromorphological processes. A wide main stream with anabranches, open gravel banks and islands, lined by pioneer vegetation and bushes of willows, poplars and tamarisk, give the Vjosa floodplain an exceptional character.

MEANDERING SECTION

The lower section is characterised by the widening of the Vjosa River and the formation of wide meanders. Between the towns of Fieri and Vlora, the Vjosa River crosses the Myzeqe lowlands and flows towards the Adriatic Sea. The river delta is located north of the Narta Lagoon, where the river reaches the sea.

The river gradient is low over the last 40 km before it drains into the Adriatic Sea. Here the river changes from a branching to a meandering course over a narrow stretch of about 15 km, ending in the Vjosa Delta, which comprises over 15 km of river course and almost 30 km of coastline, including the Narta Lagoon in the south (20,000 ha).

Map 3 - Tourism in Vlore (Author)

Figure 30 - Vjosa River © Jaka Subic

Figure 31 - Vjosa River, Albania © Roland Dorozhani

Figure 32 - Vjosa River, Tepelena, Albania © Christian Baumgartner

NDIKIMET NË REZERVOR
2.2

IMPACTS OF HYDROPOWER PLANTS

Although the Vjosa is still mainly unimpaired, it is seriously threatened. In the next few years, about 3000 hydropower dams are planned in the Balkans, while about 1000 are already under operation. About 37% (1004) of the planned projects are to be constructed in nature protection areas (see the Eco-Masterplan for Balkan rivers (2018)).

Within the next few years every large tributary and the main river of the Albanian Vjosa watershed is scheduled to be damned, interrupted, or hydromorphologically altered. The river has recently come under threat from two already-commissioned hydropower dams in its lower reaches. While it is evident that the construction of these HPPs would have a severe impact on the conservation value of the Vjosa, the decision to construct these dams has been made without any comprehensive assessment of the possible environmental and socioeconomic effects and without considering possible alternatives.

UPSTREAM EFFECTS

The major impact that HPPs have on upstream river communities is that of continuum disruption. Migratory species are blocked from reaching their spawning habitats, genetic exchange is prevented, and the creation of genetic ‘island populations’ is supported. The genetic impoverishment caused by this isolation decreases the health of the entire population by reducing the possibility of better adaption through the random genetic mutation of individuals (Schmutz and Sendzimir 2018).

The upstream reaches of the river are affected by the dam itself as a migration barrier. It essentially impoverishes migratory species, including catadromous and anadromous fish species like eels, among others. This habitat fragmentation leads to an impoverished aquatic fauna, including aquatic invertebrates, owing to the isolation of populations and reduced genetic exchange (Monaghan et al. 2002; Zwick 1992).

RESERVOIR

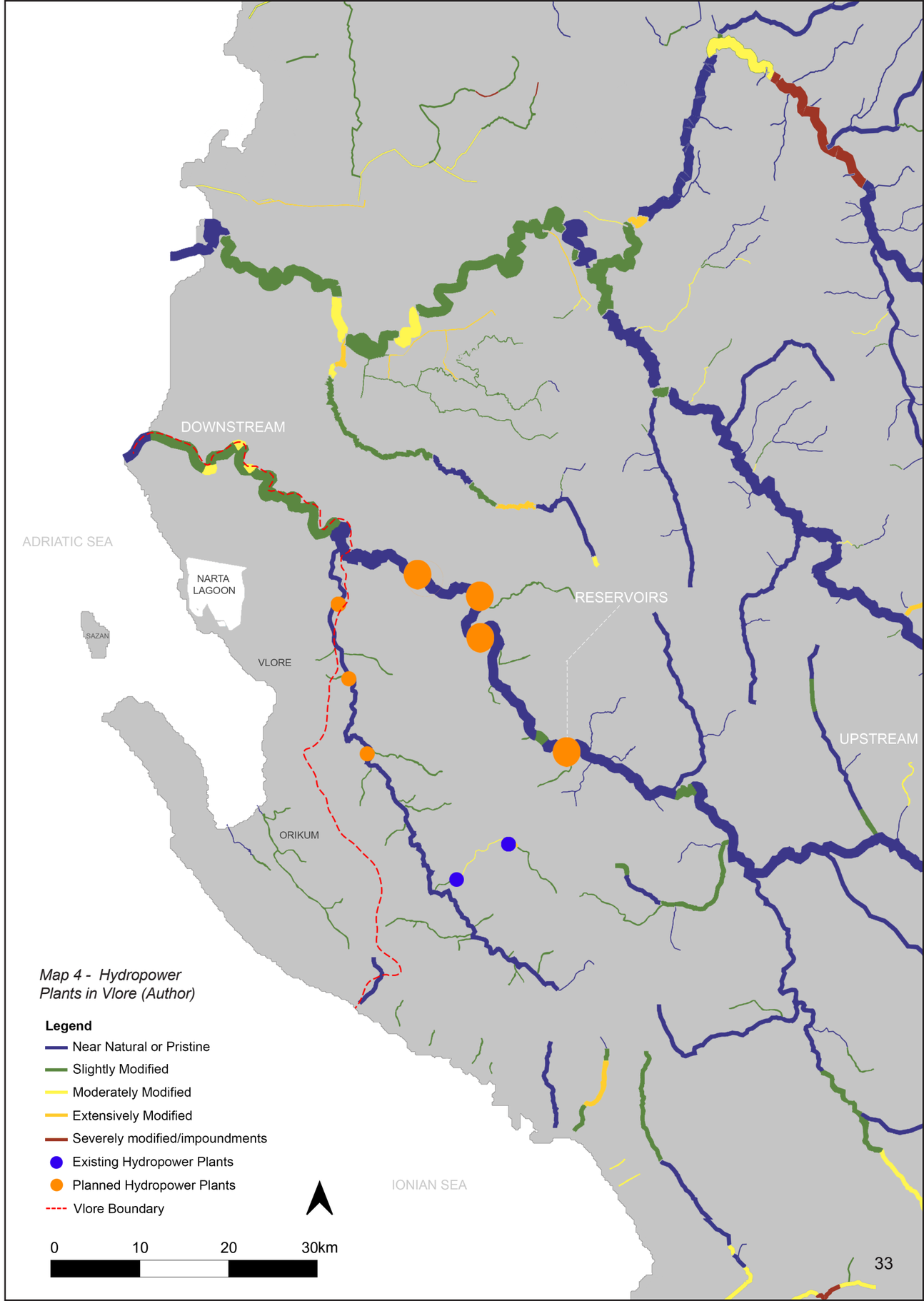
The reservoir is a completely new ecosystem. It is not comparable with the river itself as flow is the decisive parameter, responsible for oxygen content and sediment distribution among other factors. Within the reservoir, the temperature and discharge regime are completely altered. Fine sedimentation negatively affects most riverine biota, especially macroinvertebrates, leading to a complete turnover of the community and reducing the biodiversity to just a few lacustrine taxa. Biodiversity can be high in littoral habitats, but they suffer regular disturbance, such as artificial water level fluctuations, drawdowns, and floods. By exceeding subtle thresholds, these fluctuations can result in littoral dead zones (Schmutz and Moog 2018).

The large-scale destruction of the semiterrestrial bank and floodplain habitats owing to damming is particularly relevant in the case of the planned Vjosa HPP, where the entire valley floor will be flooded.

DOWNSTREAM

Sections downstream of the reservoir are seriously affected as hydrological dynamics are dampened considerably during HPP operation. In combination with sediment trapping by the reservoir, this leads to the incision of the riverbed, changing the geomorphological characteristics and habitat availability completely. As delta areas are dependent on substrate input from upstream, the hampered sediment supply can change these areas considerably. Nutrient cycling and food web alterations within the reservoir, combined with changes in water temperature, influence the composition of the whole community downstream of the outlet.

HPP operations lead to variable and short-term changes in hydrology, according to power demand. This so-called hydropeaking frequently causes the drift and stranding (owing to the reduction of the wetted area) of fish and macroinvertebrates, considerably reducing biodiversity and biomass in the downstream sections of the river .
(Greimel et al. 2018; Schülting et al. 2016).



Map 4 - Hydropower Plants in Vlore (Author)

BIODIVERSITETI I VJOSËS

2.3

BIODIVERSITY OF THE VJOSA BASIN

Out of 1175 species, 865 were evaluated by scientfic experts regarding the impact of the Kalivaç HPP (in the proposed reservoir area, and downstream and upstream of it) on their populations. The evaluated species included 340 arthropods, 299 vascular plants,109 molluscs, 36 fish, 24 birds, 24 mammals, 19 reptiles, 9 amphibians, and 5 non-vascular plants.

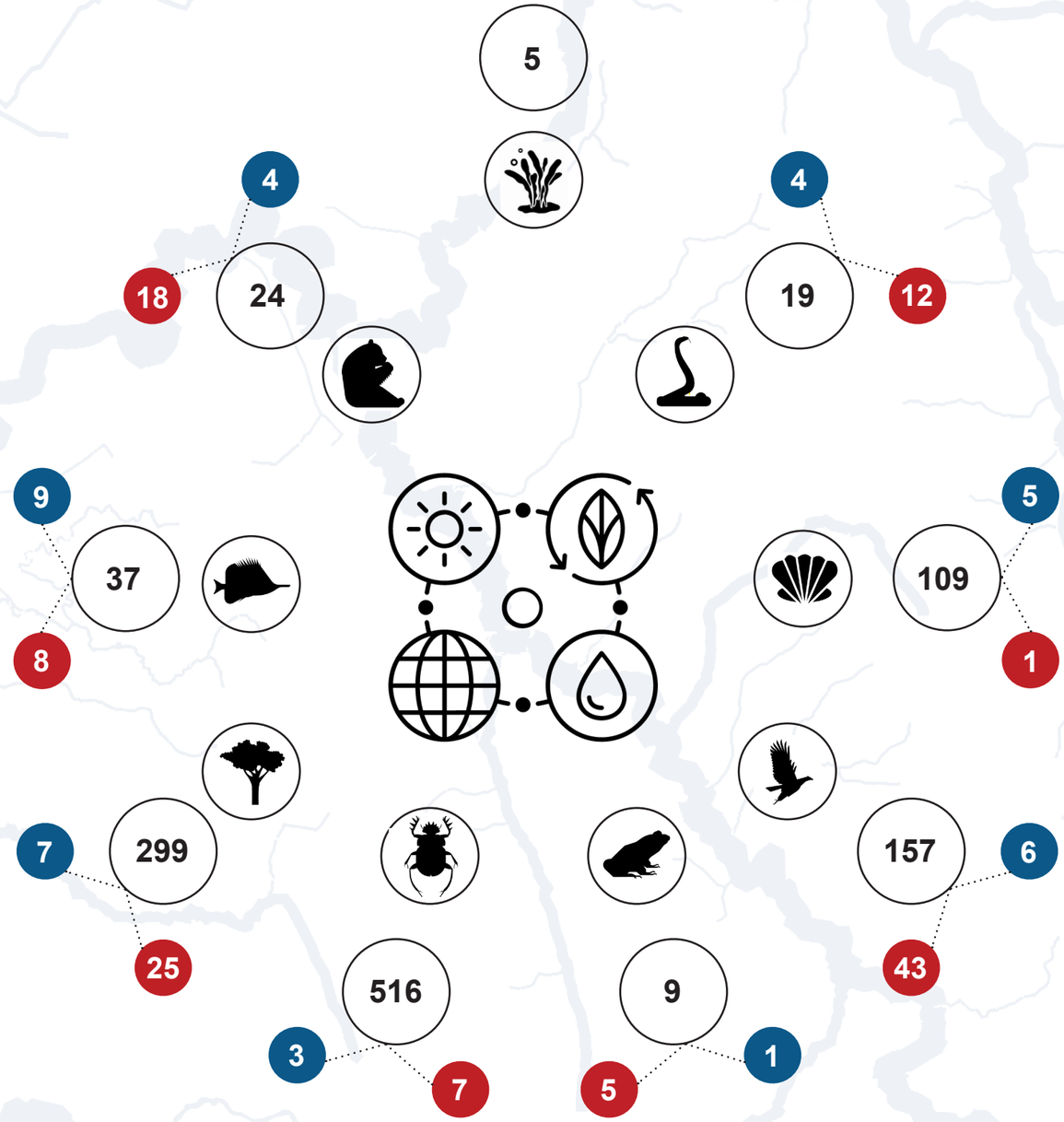


Figure 33 - Biodiversity in the Vjosa Basin (Author)

BIMËSIA DHE HABITATET

2.4

VEGETATION & HABITATS

More than 570 species of higher plants have been recorded in coastal habitats of the Vjosa delta-Narta lagoon; furthermore, some 68 higher mushrooms are recorded there as well (MoE 2009).

More than 700 higher plant taxa were reported by Malo (2010) in his PhD about flora and vegetation of Gjirokastra district; about 12 taxa were new for Albania, 40 taxa were sub-endemics, and 30 taxa were rare or endangered (Malo & Shuka 2008a, 2009, 2013); Viola acrocerauniensis and Stachys sericophylla (Malo & Shuka 2008b, Shuka & Malo 2009), for example, are endemics of the region.

Other endemic species have been reported recently, e.g. Campanula longipetiolata, Gymnospermium maloi, and Hypericum haplophylloides, recorded in the canyon of Luzati an in the subalpine grasslands of the Drino valley (Tan et al. 2011).

Photo gallery of vegetation assemblages: A: Nanocyperion-community; B: Typha minima-community ; C: Platanus orientalis-Alnus glutinosa-community; D: Regularly burned stand with dominating cogongrass (Imperata cylindrica) and a single individual of monk's pepper (Vitex agnus-castis) ; E: Populus nigra-Populus alba-community.

Sourced from Anton Drescher

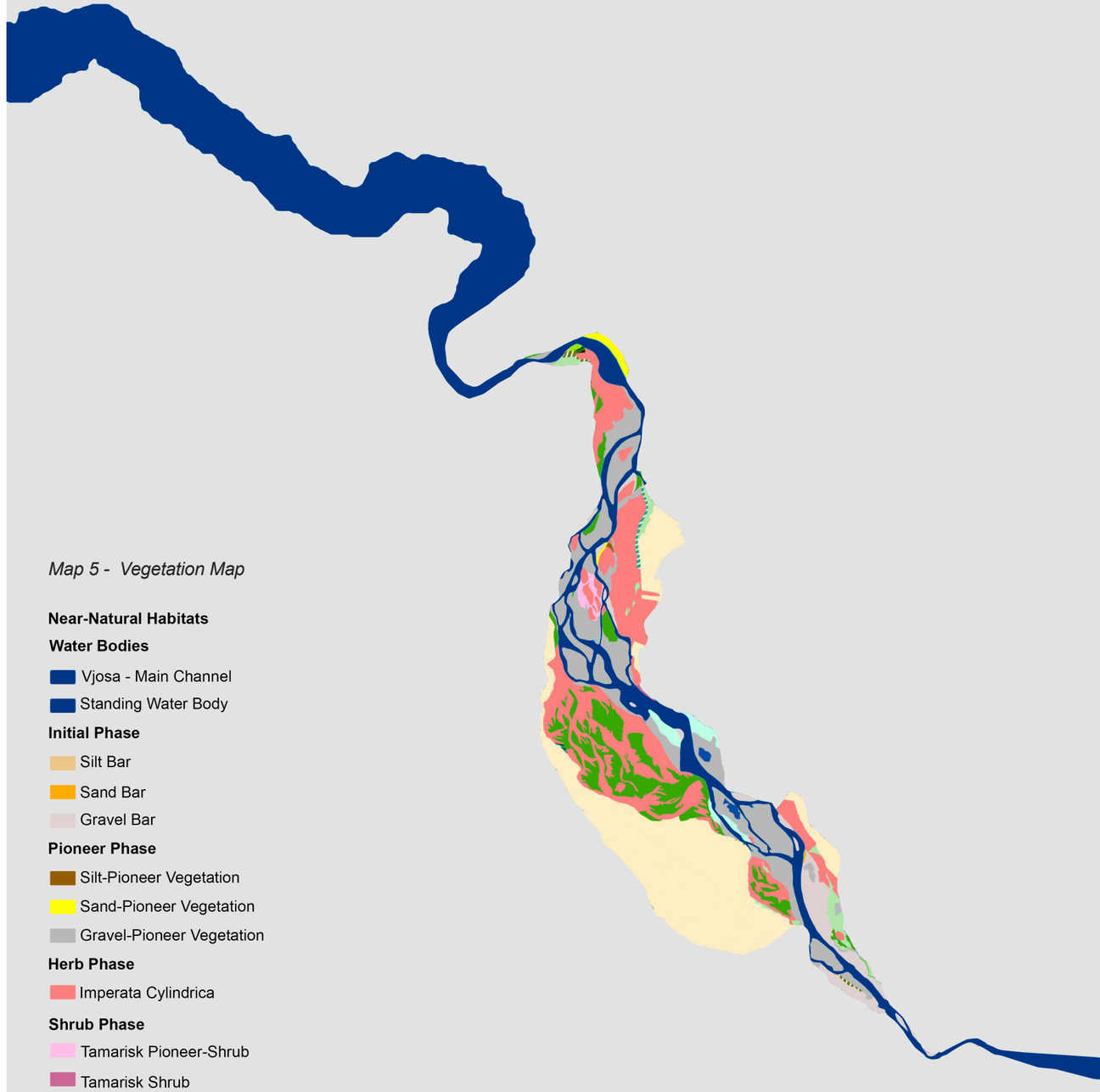
Karl-Franzens-Universität Graz, European Commission (Ed.), Save the Blue Heart of Europe 2017: Vjosa River – Europe's unknown wild jewel. 2013: Interpretation manual of European Union habitats – EUR28

Figure 34 - A

Figure 35 - B

Figure 36 - C

Figure 37 - D



Map 5 - Vegetation Map

Figure 38 - The image showcases the variety of aquatic & semi-terrestrial habitats along the meandering section of the Vjosa. The higlighted sections correspond to their respective colors in the table below & on the map. Data sourced & compiled from Shumka S., Bego F., (© PPNEA), Vjosa Baseline Survey & EEA.

Habitat Type	Description	Species
Vjosa	Running Water	
3220	Alpine rivers and the herbaceous vegetation along their banks	
3250	Constantly flowing Mediterranean rivers	Glaucium flavum
3230	Alpine rivers and their ligneous vegetation with Myricaria germanica	Myricaria germanica
3240	Alpine rivers and their ligneous vegetation with Salix eleagnos	Salix eleagnos
92D0	Southern riparian galleries and thickets	Nerio-Tamaricetea and Securinegion tinctoriae
6210	Semi-natural dry grasslands & scrubland facies on calcareous substrates	Alno-Padion, Alnion incanae & Salicion albae
91EO	Alluvial forests with Alnus glutinosa and Fraxinus excelsior	Alno-Padion, Alnion incanae & Salicion albae
t	Platanus orientalis and Liquidambar orientalis woods	Platanion orientalis

Table1 - Vegetations & Habitats (Author)

Figure 39 - Glaucium flavum

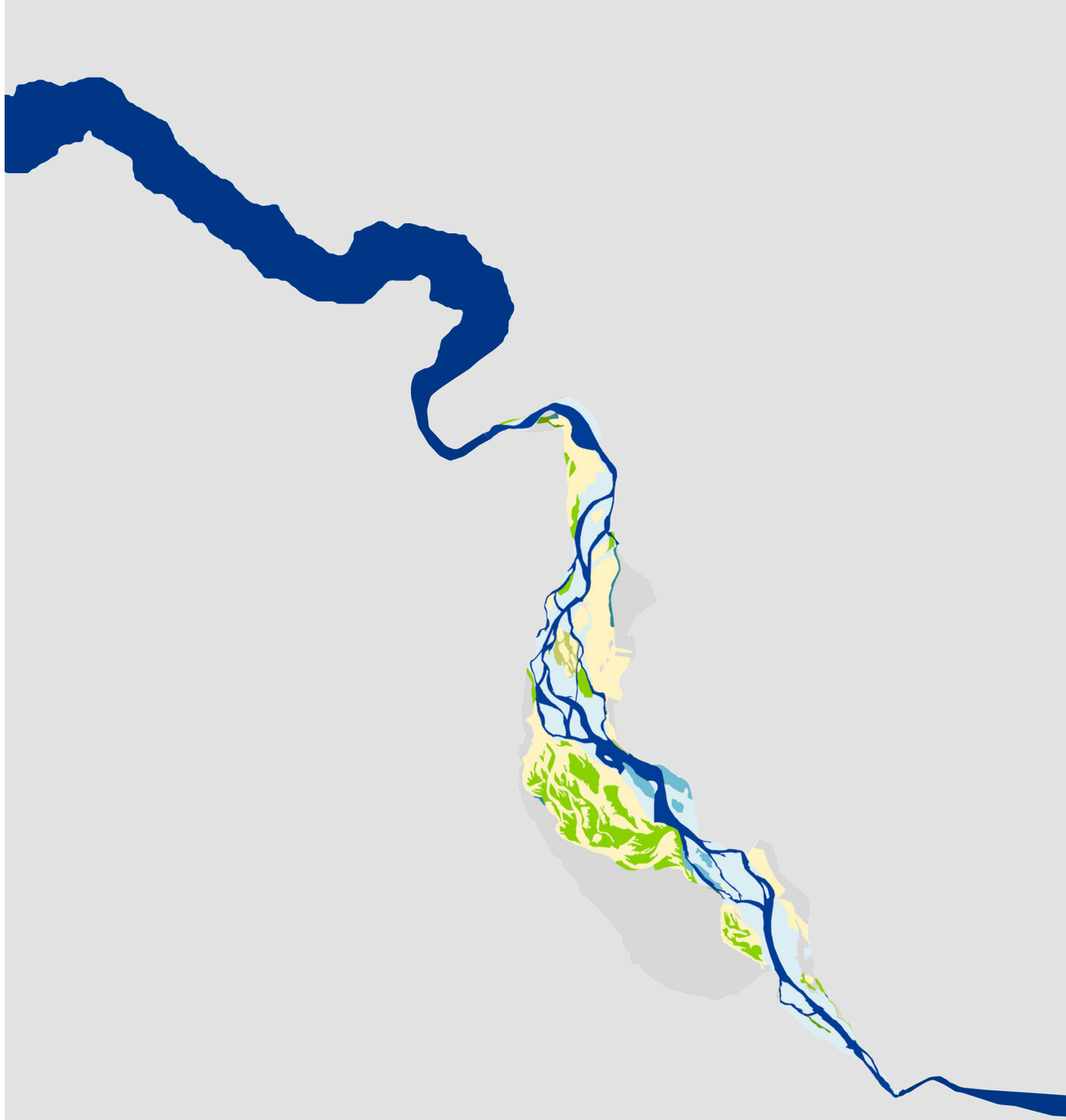
Figure 40 - Myricaria germanica

Figure 41 - Salix eleagnos

Figure 42 - Securinegion tinctoriae

Figure 43 - Alno incanae

The figure showcases the variety of species found along the river basin in their respective habitats.
Data sourced & compiled from Shumka S., Bego F., (© PPNEA), Vjosa Baseline Survey & EEA.



Map 6 - Flora Faune Habitats

FLORA

2.4.1

FLORA

Flora and vegetation of the Vjosa catchment have scarcely been studied, and almost only
in the last ten years. It is difficult to ascertain a total number of higher plants for the whole Vjosa catchment; however, experts confirm that it could be more than 1500 taxa (Shuka pers. comm.). More than 570 species of higher plants have been recorded in coastal habitats of the Vjosa delta-Narta lagoon; furthermore, some 68 higher mushrooms are recorded there as well (MoE 2009).

More than 700 higher plant taxa were reported by Malo (2010) in his PhD about flora and vegetation of Gjirokastra district; about 12 taxa were new for Albania, 40 taxa were sub-endemics, and 30 taxa were rare or endangered (Malo & Shuka 2008a, 2009, 2013); Viola acrocerauniensis and Stachys sericophylla (Malo & Shuka 2008b, Shuka & Malo 2009), for example, are endemics of the region.

Other endemic species have been reported recently, e.g. Campanula longipetiolata, Gymnospermium maloi, and Hypericum haplophylloides, recorded in the canyon of Luzati and in the subalpine grasslands of the Drino valley (Tan et al. 2011).

The richness in plant species is important for the medicinal and aromatic plant industry. About 380 species of MAPs (Medical and Aromatic Plants) have been recorded within the watershed, 330 of which are wild species (Miho & Shuka, 2017). About 46 species are endangered, threatened, or protected to varying degrees, but are still harvested in the wild,
e.g. Salvia officinalis, Origanum vulgare, Hypericum perforatum, Orchis spp., Sideritis raeseri, Laurus nobilis, Juglans regia, Juniperus spp., Sambucus nigra, Tilia spp., etc. There appears to be little correlation between the HPP development and MAP species, other than isolated flooding; however, about 70 species grow near water courses and are therefore potentially at risk from HPP activities (Miho & Shuka 2017, Amirault et al. 2016); some of them belong to the Albanian Red List of species (MoE 2013).

Figure 44 - Hypericum Haplophylloides

Figure 45 - Campanula longipetiolata

Figure 46 - Alkanna corcyrensis

Figure 47 - Cymbalaria microcalyx subsp.

Figure 48 - Lilium candidum

Figure 49 - Silene cephallenia

Rare plants from the calcareous rocky slopes with chasmophytic vegetation.
This habitat type occurs almost everywhere, along the river and its tributaries (© L. Shuka).

Figure 50 - Ophrys helenea

Figure 51 - A. morio ssp. caucasica

Figure 52 - Ophrys sphegodes

Figure 53 - Crocus hadriaticus

Figure 54 - Ophrys mammosa

Figure 55 - Ophrys epirotica

Rare plants from the alluvial forests with Alnus glutinosa and Fraxinus excelsior.
They form arborescent galleries of tall Salix alba and are important sites for orchid species (© L. Shuka).

FAUNË

2.4.2

MAMMALS

The area harbours around 70 of the 86 registered terrestrial mammal species in Albania (MoE 2009, Bego unpublished data). The European otter (Lutra lutra) is one of the significant elements of the entire Vjosa river system (Bego et al. 2001, Bego et al. 2008, Hysaj & Bego 2008, Bego & Hysaj 2018 this volume). Large carnivores are also mentioned, such as the brown bear (Ursus arctos) and wolf (Canis lupus). Due to their mobility, the large carnivores can be found in different habitats within the valley. Large mammals in the Vjosa watershed also comprise the Chamois (Rupicapra rupicapra balcanica), the roe deer (Capreolus capreolus), and wild boar (Sus scrofa). serotinus, Myotis bechsteini, and M. capaccinii). Other characteristic mammals are the red squirrel (Sciurus vulgaris), fat dormouse (Glis glis), hazel dormouse (Muscardinus avellanarius), beech marten (Martes foina), badger (Meles meles), red fox (Vulpes vulpes), and wild cat (Felis silvestris). The study area is the only known occurrence of the mole rat (Spalax leucodon) in Albania (Bego et al. 2014).

BIRDS

There is a wide variety of bird species present within the Vjosa watershed, with 257 recorded species connected to the different ecosystems and habitats (MoE 2009, Bego unpub. data) (Fig. 3). Species such as the Eagle Owl (Bubo bubo), Long-legged Buzzard (Buteo rufinus), Levant Sparrowhawk (Accipiter brevipes), Lanner Falcon (Falco biarmicus), Sparrowhawk (Accipiter nisus), Golden Eagle (Aquila chrysaetos), European Honey Buzzard (Pernis apivorus), Goshawk (Accipiter gentilis), Short-toed Eagle (Circaetus gallicus), Egyptian Vulture (Neophron percnopterus), Grey-headed Woodpecker (Picus canus), Barn Owl (Tyto alba), Lesser Kestrel (Falco naumanni), and Common Kestrel (Falco tinnunculus) are present and are good indicators of the Vjosa ecosystem's condition.
europaea).

Mammals:

The area harbours around 70 of the 86 registered terrestrial mammal species in Albania (MoE 2009, Bego unpublished data).

Figure 56 - European otter (Lutra lutra)

Figure 57 - Brown bear (Ursus arctos)

Figure 58 - Wolf (Canis lupus)

Mammals from the calcareous rocky slopes with chasmophytic vegetation
Due to their mobility, the large carnivores can be found in different habitats within the valley. (Bego et al. 2001, Bego et al). 2008, Hysaj & Bego 2008, Bego & Hysaj 2018

Birds:

There is a wide variety of bird species present within the Vjosa watershed, with 257 recorded species connected to the different ecosystems and habitats (MoE 2009, Bego unpub. data)

Figure 59 - Dalmatian Pelican (Pelecanus crispus)

Figure 60 - Greater Flamingo (Phenicopterus roseus)

Figure 61 - Pied Avocet (Recurvirostra avosetta)

Due to their mobility, the large carnivores can be found in different habitats within the valley. (Bego et al. 2001, Bego et al). 2008, Hysaj & Bego 2008, Bego & Hysaj 2018

PESHK

2.4.3

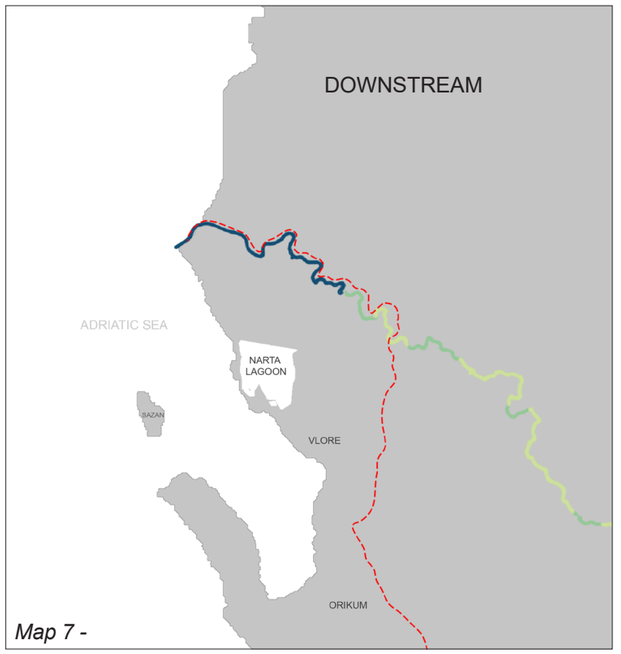
FISH

The fish fauna of the Vjosa is of special significance and importance owing to its unique geographical and biological background. The Vjosa is one of the last medium-sized rivers with little tono anthropogenic alteration owing to hydropower production.

Currently,the river course on Albanian territory has no migration barriers for fish and provides various habitats for endangered and endemic fish species.

(Shumka et al. 2018).

Figure 62 - Species of European eel recorded in this river study (Anguilla anguilla) is considered Critically Endangered, one is Endangered, and a further three species are Near Threatened and Vulnerable, according to the IUCN red list. (Meulenbroek et al. 2018a; Shumka et al. 2018)



Map 7 -

1 Reproductive Strategy

14

LITHOPHILIC species deposit eggs on rocks, rubble, or gravel substrate.

8

PELAGOPHYLIC species release their non-adhesive eggs into open water. All these species are related to the sea.

5

POTAMODROMOUS fish spend their entire lifecycle within fresh water and exhibit migration to varying degrees.

3

LITHO / PHYTOPHILIC species deposit their eggs on submerged plants or on other submerged items such as gravel or logs.

2 Migration Based

7

DIADROMOUS fish for which movement into freshwater is not obligate to fulfil their lifecycle.

5

ANADROMOUS fish that are born in freshwater & migrate to the ocean as larvae or juveniles where they are adults before migrating back into freshwater to spawn.

1

CATADROMOUS fish that are born in saltwater, then migrate into freshwater as juveniles where they grow into adults before migrating back into the ocean to spawn.

3 Flow Velocity Based

17

RHEOPHILIC fish prefer to live in fast-moving water.

8

EURYTOPIC or indifferent fish do not show a clear preference for flowing or standing water.

6

STAGNOPHILIC fish prefer stagnant water.

Classification of fish species in the Vjosa River based on spawning guild affiliations, migration & river flow. (Fame Consortium, complemented by information from FishBase & Vjosa Baseline Survey, April 2021) (Froese and Pauly 2010). information from FishBase (Froese and Pauly 2010). (2005), complemented by information from FishBase (Froese and Pauly 2010).

Alburnus scoranza	3	3	3
Squalius platyceps	3	3	3
Anguilla anguilla	2	2	2
Carassius gibelio	1	1	1
Chondrostoma vardarense	3	3	1
Barbus prespensis	2	3	0
Alburnoides prespensis	2	3	0
Gobio skadarensis	2	3	1
Pachychilon pictum	2	3	1
Oxynoemacheilus pindus	2	2	0
Salmo farioides	1	1	0
Cobitis ohridana	1	1	0
Luciobarbus albanicus	1	1	0
Pseudorasbora parva	1	0	1
Dicentrarchus labrax	1	1	2
Gambusia holbrooki	0	0	1
Chelon ramada	1	2	3
Gobiidae sp.	0	0	1

Table2 - Abundance of fish in different morphological river sections in the Vjosa River; 0 = not present, 1 = low abundance (0–1 individuals per 100 m), 2 = present (1–5 individuals per 100 m), and 3 = abundant (>5 individuals per 100 m) (Vjosa Baseline Survey, April 2021)

Constrained Sections
Braided Sections
Meandering Sections

Figure 63 - Chelon ramada

Figure 64 - Dicentrarchus labrax

Figure 65 - Gobiidae sp

Figure 66 - Gambusia holbrooki

Only four species were more frequently prominent in the meandering section than in the braided or constrained sections,

There is a clear distinction between species that showed a high abundance in all three sections, such as Alburnus scoranza and Squalius platyceps species that showed a moderate abundance in all areas, like Anguilla.

(Vjosa Baseline Survey, April 2021)

AMFIBËT DHE REPTILI

2.4.4

AMPHIBIANS & REPTILES

The amphibians (13 out of 16 species reported from Albania) are a taxonomic group usually connected with aquatic habitats during their life-cycle, sis), Leopard snake (Elaphe situla), Four-lined snake (Elaphe quatuorlineata), Hermann's tortoise (Testudo hermanni), European pond turtle (Emys orbicularis), Erhard's wall lizard (Podarcis erhardii), Balkan green lizard (Lacerta trilineata) and the European green lizard (Lacerta viridis). The Vjosa catchment is also home to the meadow viper Vipera ursinii ssp. graeca, a species which was just recently found in Albania (Korsós et al. 2008). Comprising both aquatic and terrestrial species (Fig. 11). Frank et al. (2018 this volume) report additional data on amphibians and reptiles of the Vjosa River, of which most are mentioned in international Red-lists.

Of the 37 reptile species reported from Albania, 32 are present in the Vjosa watershed. Some of the most common reptiles are the Balkan whip snake (Coluber gemonensis), Leopard snake (Elaphe situla), Four-lined snake (Elaphe quatuorlineata), Hermann's tortoise (Testudo hermanni), European pond turtle (Emys orbicularis), Erhard's wall lizard (Podarcis erhardii), Balkan green lizard (Lacerta trilineata) and the European green lizard (Lacerta viridis).

The Vjosa catchment is also home to the meadow viper Vipera ursinii ssp. graeca, a species which was just recently found in Albania (Korsós et al. 2008).

Figure 67 - Emys orbicularis

Figure 68 - Rana graeca

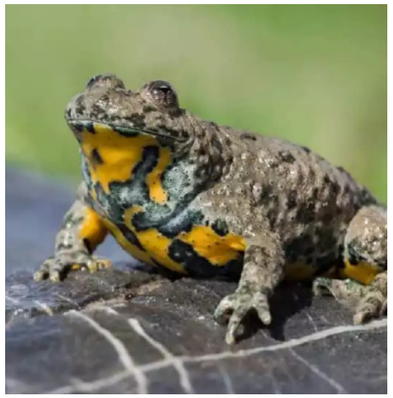


Figure 69 - Bombina variegata

Reptiles found along the Vjosa valley basin & river :

Figure 70 - Meadow viper (Vipera ursinii ssp.)

Figure 71 - Balkan green lizard (Lacerta trilineata)

Figure 72 - Four-lined snake (Elaphe quatuorlineata)

Due to their mobility, the large carnivores can be found in different habitats within the valley. (Bego et al. 2001, Bego et al).2008, Hysaj & Bego 2008, Bego & Hysaj 2018

NDIKIMET EKOLOGJIKE

2.5

ECOLOGICAL IMPACTS

1 The filling up of Vjosa reservoirs with sediment is calculated to occur within 30–40 years.

2 High economic cost are expected for sediment management and treatment.

3 Riverbed incision will be the consequence if the sediment transported by the Vjosa is trapped in hydropower reservoirs

4 Vjosa Narta Lagoon erosion will increase owing to a lack of sediment transport.

5 The protected Bird Area in the southern part of the Vjosa Delta will be strongly affected.

6 Degradation of ecology and loss of European sea-side tourism as well as of eco-tourism in the Vjosa catchment.

7 The most important effect is the direct loss of floodplain vegetation as a result of damming. This loss is irreversible and cannot be compensated for by mitigation measures.

8 Owing to the lack of sediment and as a consequence of reduced hydromorphodynamics, the progression of the vegetation will increase, and the riverbed will become overgrown with vegetation in the downstream section of the river.

Birds	24						24
Amphibians	5		2	1	1		9
Reptiles	17			2			19
Mammals	20	2	2				24
Fish	4	14	18				36
Molluscs	39	17	23	26	4		109
Arthropods	117	136	26	33	28		340
Vascular plants	189	52	45	11	2		299
Non-vascular plants	5						5
Total	420	221	116	73	35		865
					520		

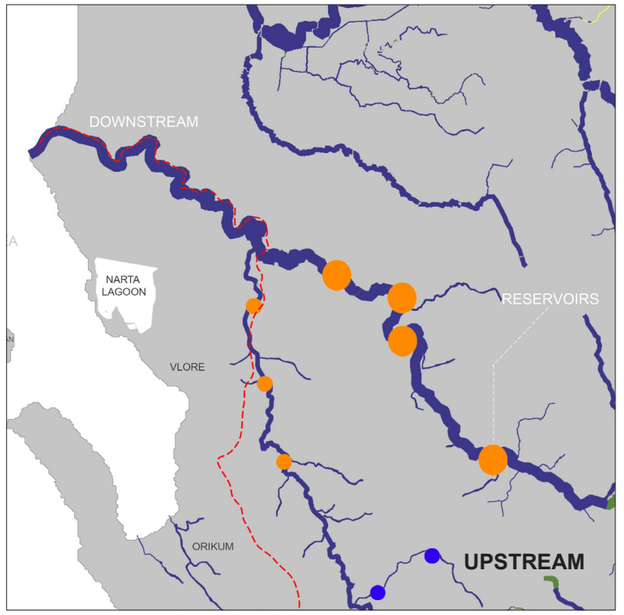
Table3 - Degree of Impact on species group within the downstream section.

Birds	24						24
Amphibians	9						9
Reptiles	19						19
Mammals	20	4					24
Fish	3	16				17	36
Molluscs	37	65	3	4			109
Arthropods	101	223	12	4			340
Vascular plants	57	228	10	4			299
Non-vascular plants		5					5
Total	270	541	25	12		17	865
					29		

Table4 - Degree of Impact on species group within the reservoir section.

Birds	24						24
Amphibians	9						9
Reptiles	19						19
Mammals	20	4					24
Fish	3	16				17	36
Molluscs	37	65	3	4			109
Arthropods	101	223	12	4			340
Vascular plants	57	228	10	4			299
Non-vascular plants		5					5
Total	270	541	25	12		17	865
					29		

Table5 - Degree of Impact on species group in the upstream section.



Map 8 - The map highlights the zones of high impact on the biodiversity & ecology of the area if the proposed power plants are built.

Inestimable

Insignificant

Moderate Reduction

Severe Reduction

High Extinction Risk

Total Local Default

Planned Reservoirs

Existing Powerplants

Rivers

KONKLUZIONET 2.6

CONCLUSIONS

Threats to the Vjosa River Valley can be summarized under the headings: Pollution, Land degradation, Hydromorphological change, Land use, and Natural factors. Table 6 below shows the threats by river section and the overall estimated value for the river as a whole.

Threats such as large-scale changes to the upstream water regime (e.g., construction of a large reservoir) may simply negate the benefits provided by downstream protected status, contributing to further declines despite good intentions.

	Upper Section	Middle Section	Lower Section
Pollution			
Solid waste/waste management	++	+	++
Groundwater pollution	+	++	+
Water pollution	0	++	++
Land degradation			
Industrialisation	0	++	++
Urbanisation	0	+	++
Hydromorphological change			
Small hydropower plants	++	+	++
Land use			
Oil dwellings + bitumen excavation	0	++	0
Gravel extraction (industrial)	+	++	+
Stone mining (industrial)	+	0	0
Water extraction (bottling/ industrial)	0	++	++
Water extraction/ irrigation	0	+	++
Firewood collection	0	0	0
Poaching	+	+	++
Plantations of alien species	0	+	+
Intensification of agriculture	0	+	++
Transformation of forest into croplands	0	++	++
Tourism development	0	0	++
Natural factors			
Riverbank/coastal erosion	0	+	++
Floods	0	0	+
Invasive alien species	0	0	?
Diseases	+	+	0

Table6 - Threats to the Vjosa Valley.
Legend: ++ very high threat, + high threat, 0 no threat, ? unknown.

Conversely, large-scale gravel extraction could lead to increased erosion of the coastal area, but also affect the upstream flooding regime.
River and freshwater protected areas need to be custom-designed to fully overcome the challenges of water extraction, pollution, cumulative threats and lack of ecosystem connectivity.

CONCLUSIONS FOR THE VJOSA

The nationally, regionally and globally sig-nificant native biodiversity and outstanding scenic values of the Vjosa River Valley are the result of undisturbed river hydromorphology and fully functioning natural processes, which need to be protected along the entire Vjosa River and its main tributaries: any change in water volumes and sediment transport would dramatically alter the last river ecosys-tem of its kind in the Balkans and on a wider European scale, and disrupt the migration route of globally endangered fish species.

The protection of the existing natural phe-nomena and features, together with the rich cultural heritage, should be based on the establishment of a protected area, where the core protection sub-zone should be con-centrated along the narrow riverbed (wider only in the middle section of the Vjosa River) and its tributaries and the brackish, coastal Narta Lagoon. Protection of the narrow watercourse must be secured along the entire course of the river in order to achieve basic protection of the “continuity” of the water-course and sediment transport, since any potential disturbance along the course can have upstream and downstream effects. It should be noted that the strict protection of the narrow riverbed includes only those areas that are predominantly not used or exploited by humans.

The concept of protecting the wild river and its tributaries is based on strict protection of the entire narrow riverbed of the rivers, while allowing existing traditional land use activities (such as agriculture and grazing) to continue if managed for subsistence use and not on an industrial scale, with the possibility of developing the entire Vjosa River Valley as an excellent area for green, cultural and rec-reational tourism.

Although the brackish Narta Lagoon is not directly connected to the freshwater river ecosystem of the River Vjosa estuary in an ecological context, it is of significant conser-vation value at the national and global scales, and should be part of the Vjosa River Valley protected area.

Sources:

Drescher, A. (2018). The Vjosa (Vjosë) – the floodplains of an outstanding gravel bed river in southern Albania. Acta ZooBot Austria, früher Verhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich Band 155/1: 85-105.

Dudley, N. (ed.) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. Dudley, N., Shadie, P. and Stolton, S. (2013).

Guidelines for Applying Protected Area Management Categories including IUCN WCPA Best Practice Guidanceon Recognising Protected Areas and Assigning Management Categories and GovernanceTypes. Best Practice Protected Area Guidelines Series No. 21. Gland, Switzerland: IUCN.

EcoAlbania (2021). Proposal for establishing the Vjosa Wild River National Park.
Kuiters, A.T., van Eupen, M., Carver, S., Fisher, M., Kun, Z., Vancura, V. (2013). Wilderness register and indicator for Europe.

Final report. Meulenbroek, P., Shumka, S., Schiemer, F. (2018). First reconnaissance of habitat partitioning and fish diversity in the alluvial zone of the river Vjosa, Albania. Acta ZooBot Austria, früher Verhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich Band 155/1: 177-186.

Meulenbroek et al. (2021). Biodiversity values of the Vjosa River Valley. Unpublished.
NAPA (2021). Draft Decision on Approval of Protected Area Boundaries. Unpublished.
Protected Areas Act No. 81 (2017). Official Gazette 116.

Schiemer, F., Drescher, A., Hauer, C., Schwarz, U. (2018). The Vjosa River corridor: a riverine ecosystem of European significance. Acta ZooBot Austria, früher Verhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich Band 155/1: 1-40.

The Vjosa catchment – a natural heritage. Acta ZooBot Austria, früher Verhandlungen derZoologisch-Botanischen Gesellschaft in Österreich Band 155/1: 349 - 376.Skrame, K., (2021). Study/Inventory of the current land-use patterns of the Vjosa River Basin area.

EKOSISTEME DETARE
2.7

MARINE ECOSYSTEMS

The composite environmental system of the Albanian coast was generally preserved in its natural and pristine state until a few years ago, and it could represent one of the last hotspots of biodiversity within the Mediterranean marine ecosystems (Anonymous, 2002).

In recent years, complex natural processes and uncontrolled human activities have occurred in this area (mainly related to urban and tourism developments) and are exposing the Albanian coast, and in particular the Vlora Gulf, to a strongly increasing impact. On this basis, a loss of relevant coastal habitats and a resulting extensive decrease in the ecological value of the coastal zone and marine habitats are expected. Habitat loss is particularly severe in coastal marine ecosystems, where human activities have historically been concentrated (Airoldi and Beck, 2007; Martin et al., 2005).

This is particularly worrying because these coastal areas contain some of the most productive and varied, but also degraded, ecosystems in world (Edgar et al., 2000; Suchanek, 1994).

On the shallower coastal belt, a muddy Posidonia matte has replaced the previous Posidonia meadow, which is now restricted to narrow residual patches of seagrass along the eastern side of the Vlora Gulf. The increasing sedimentation due to uncontrolled discharges and wastes of inert materials. Together with the intense solid transport from the coast, have produced strongly negative consequences on Posidonia, because their leaves were covered by sediment and were severely damaged, with a consequent quick degradation of the entire meadow.

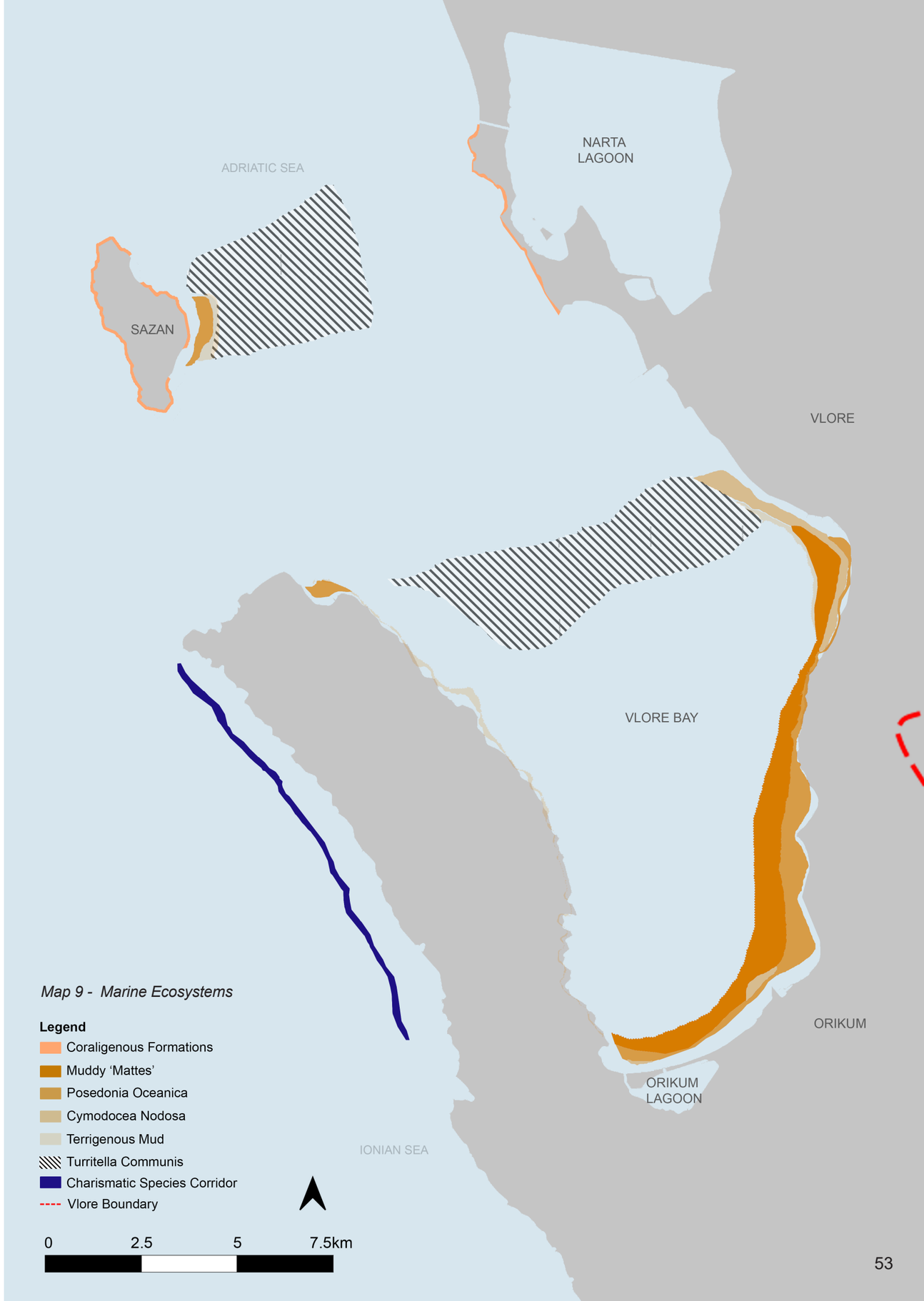
A rapid, local regression and fragmented pattern of Posidonia meadows were already detected along the coast, particularly in those areas heavily affected by huge human impacts and uncontrolled tourism activities (Beqiraj et al., 2008; Pittito et al., 2009).

The comparison between the Posidonia meadow and the muddy matte showed that the biodiversity was much lower in the muddy matte communities, which was mostly represented by the annelids Glycera unicornis, Pseudoleiocapitella fauveli, and the brittle sea stars Amphiura chiajei and A. filiformis, and had few microfilter feeders, such as bryozoans and sponges. Habitat conversion also occurs when more structurally complex natural habitats are converted to less complex habitats, which usually have lower diversity and productivity (e.g., Beck et al., 2001; Heck and Crowder, 1991).

The loss of patches of seagrass within a larger bed of P. oceanica and its replacement with a wide,muddy matte are a clear example of fragmentation and habitat degradation that, together with the consequent decrease in biodiversity, represents a severe warning for future conservation policy. In fact, habitat degradation is a serious issue that has ecosystem implications and often leads to definitive loss of natural habitats (Airoldi and Beck, 2007).

Both natural and human impacts operate on the fragile coastal ecosystem of the Vlora Gulf where two strong environmental forcings are recognized as most responsible for the habitat degradation: the copious sedimentary inputs coming from the Vjosa River and the pollution from the urban sewer from the town of Vlora and the relative hinterland that are continuously associating in the degradation of the water quality and the relative decay of the ecosystem. (Author)

Thus, the health and the equilibrium of the marine life of the Vlora Gulf are at risk from human activities and the eventual control system on the most impacted natural processes, such as the natural solid sediment transport. Further uncontrolled
building activities along the coast could again modify water movements and sedimentation with irremediable consequences on the described ecosystems as observed on the visit to Vlore for an internship. (Author)



Map 9 - Marine Ecosystems

MARINE ZONAS
2.8

MARINE ZONES

The National Marine Park Karaburun-Sazan is situated at the border between Adriatic and Ionian Sea.
The National Marine Park Karaburun-Sazan covers marine area along the coastlines of Karaburuni peninsula and Sazani island and is situated in Vlore County.

SPECIES

The underwater fauna is quite diversified and relatively abundant, especially on the western side of Rreza e Kanalit-Karaburuni and around Sazani island. Noteworthy fish species of Karaburuni waters, included in the Annex III of Barcelona
Convention are: the dusky grouper (Epinephellus marginatus), the Atlantic bluefin tuna
(Thunnus thynnus) and the swordfish (Xiphias gladius). Some important crustaceans like lobster (Homarus gammarus), the crawfish (Palinurus elephas), the greater locust lobster (Scyllarides latus), and the spiny spider crab (Maja squinado) live in this area.

CHARISMATIC SPECIES CORRIDOR

Albanian marine and littoral habitats are frequently visited by the rare marine mammals. The Monk seal (Monachus monachus) is a very rare, occasional visitor to the Albanian coastal waters. The canyons and caves of the area, often inaccessible, represent an ideal habitat for monk seals which were reported in Karaburuni peninsula. It would seem that the caves along the Albanian coastline, especially those of the western coast of the Karaburuni peninsula, could serve as a bridge for possible future monk seal repopulation of the shores of the Central and Northern Adriatic Sea, rather than important shelters for “local” monk seal breeding populations. The area is occasionally visited also by the common dolphin (Delphinus delphis) and the bottlenose dolphin (Tursiops truncates).

SPECIES

The underwater fauna is quite diversified and relatively abundant, especially on the western side of Rreza e Kanalit-Karaburuni and around Sazani island. Noteworthy fish species of Karaburuni waters, included in the Annex III of Barcelona Convention are: the dusky grouper (Epinephellus marginatus), the Atlantic bluefin tuna (Thunnus thynnus) and the swordfish (Xiphias gladius).

RARE, ENDANGERED & THREATENED SPECIES

Rare, endangered and threatened species NMP Karaburun-Sazan is home to a number of globally, regionally as well as nationally rare, endangered and threatened species of fauna. At least 36 marine species, which are of international concern and belong to the lists of endangered and/or protected species of several conventions, are present in Karaburun-Sazan area. They include seagrasses, seaweeds, sponges, cnidarians, molluscs, crustaceans, echinoderms, fishes, reptiles, pinnipeds and cetaceans. At national scale, about 75% of endangered species of marine animals, mostly benthic macro invertebrates, which belong to the Red List of Albanian Fauna (2007), have been recorded in Karaburun-Sazan area

ZONING

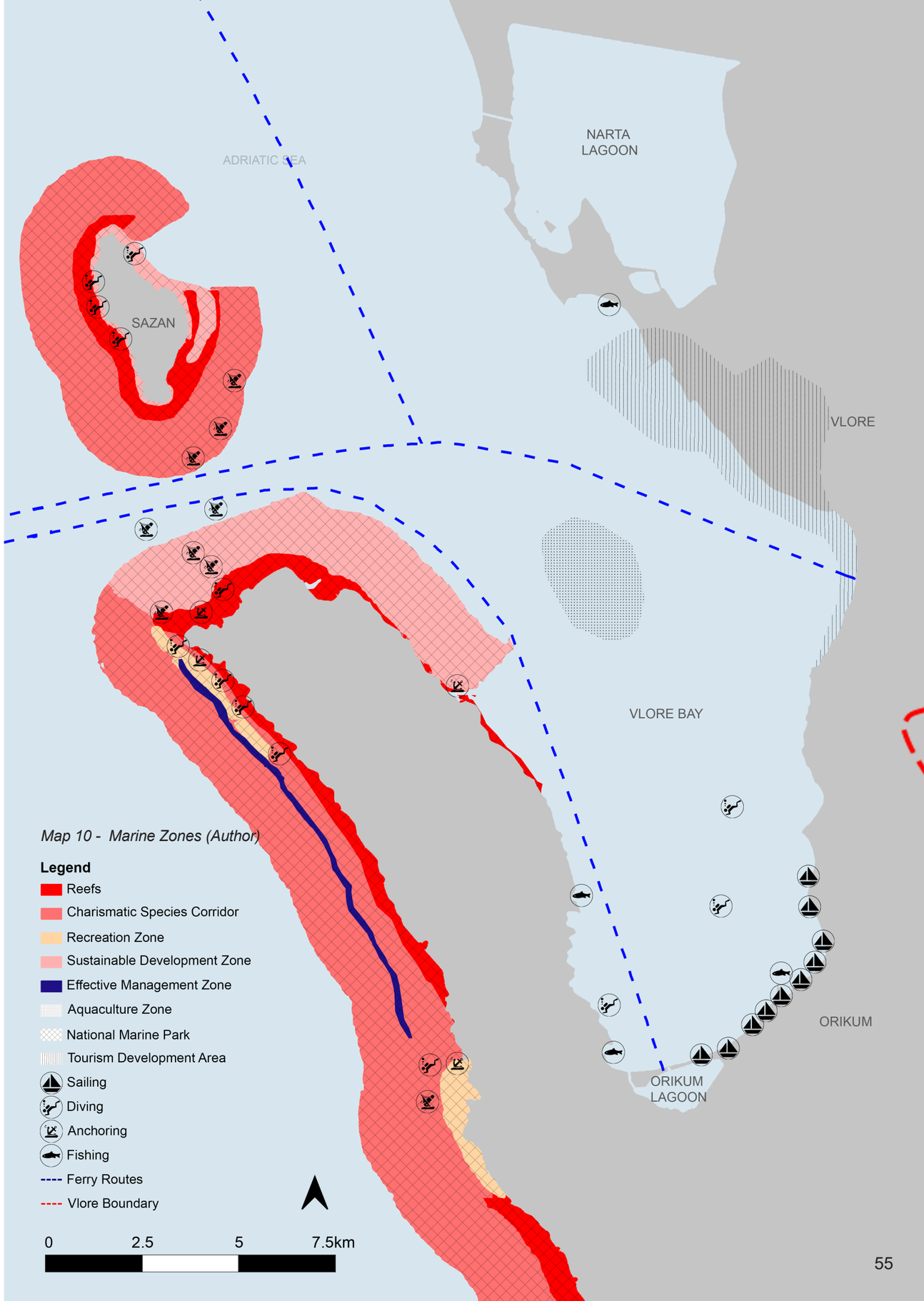
A framework, considering real conditions in the area, management categories and past experiences and adopting best international practices, the following zoning system was introduced as showcased by the map on the previous page.

1. Core zone where first level protection is applied.

2. Effective management zone, where the second level of protection is applied.

3. Recreation Zone, where the third level of protection is applied.

4. Sustainable Development Zone, where the third level of protection is applied.



Map 10 - Marine Zones (Author)

CORE ZONE

This includes areas with very high nature performance, with little or no disturbance from human activities as the area around Sazani island not more than 1 km off shore & western part of Karaburuni up to 200 m offshore.

The priority here is the conservation of nature, biodiversity, nature monuments, endangered species unique land and seascape, extraordinary natural geomorphologic and paleontological features without any permanent support intervention. These areas are managed in a way that preserves their natural status, maintains dynamic evolution of genetic resources and they are used for scientific purposes only. This zone benefits from strict protection character. The area supports scientific studies and research; low level monitoring is allowed by special permit; and visitation, if any, is very strictly regulated.

ALLOWED ACTIVITIES

No activity should occur within the Core Zone except regulated activities listed below.

NOT ALLOWED ACTIVITIES

It is strictly not allowed to perform the following activities within the Core Zone: diving, swimming and snorkelling, fishing, boating, anchoring, mooring, sailing, kayaking, any kind of water sports, maritime traffic, any kind of infrastructure development.

REGULATED ACTIVITIES

The following activities can be performed after a special permit is issued: scientific research, monitoring, waste removal, visitation only by guided tours, diving is allowed only for scientific research and monitoring purposes.

EFFECTIVE MANAGEMENT ZONE

This includes areas with high nature performance with very important natural habitats or biotopes of rare and endangered species. The priority is preservation of biodiversity, natural and scenic areas of national and international importance for spiritual, scientific, educational purpose and integrating protected area management with the sustainable and balanced use.

This zone is used for areas featuring ecosystems, landscape values and other natural values where activities that are not against the protection purpose and management objectives can occur. Only educational environmental ecotourism is allowed according to clear rules and there should be limitations for permitted areas and trails. Natural processes with minimal management interventions are allowed and there is no infrastructure development.

ALLOWED ACTIVITIES

No activity should occur within the Core Zone except regulated activities listed below.

NOT ALLOWED ACTIVITIES

It is strictly not allowed to perform the following activities within the Core Zone: diving, swimming and snorkelling, fishing, boating, anchoring, mooring, sailing, kayaking, any kind of water sports, maritime traffic, any kind of infrastructure development.

REGULATED ACTIVITIES

The following activities can be performed after a special permit is issueD: scientific research and monitoring, waste removal, diving at specific sites, only guided tours, boating excursions (limited and guided boat excursions, sailing and mooring some areas should be off limits – such are diving sitesand areas designated for water sports; signs for boats should be put), kayaking, water sports no use of jet skis and other motor water sports; clear division of water sport zones .

RECREATIONAL ZONE

This zone has a good nature performance. It is defined as a zone containing suitable terrestrial, aquatic and marine areas where the combination of activities, traditional products of the community, businesses and tourism is in line with the nature and biodiversity conservation standards.

Within the park there are 4 caves (Haxhi Ali next to Mol ii Veriut; Duk Gjoni 2km from Bristani bay; Water cave and Inglizi cave about 1 km north from Inglizi bay). In the underwater area between Galloveci cape and Gjuheza cape there are at least 5 shipwrecks. Another shipwreck is next to Bristani bay. The area has many historical and cultural values.Also this zone includes several small beaches, such as: Shën Vasili cape, Shën Jani cape, Bristani bay (3 km north of the bay), Llovizi bay and Grama bay.

ALLOWED ACTIVITIES

Sailing swimming and snorkelling, anchoring, mooring, kayaking, water sports, and visitation.

NOT ALLOWED ACTIVITIES

It is strictly not allowed to perform the following activities within the Recreational Zone: maritime traffic, mineral extraction, and collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

REGULATED ACTIVITIES

The following activities can be performed after a special permit is issued: scientific research and monitoring, diving (diving sites should be specified and diving is allowed only at those specific sites, only guided tours, limited number of divers, and traditional fishing is allowed, wildlife watching, infrastructure development infrastructure development should, no permanent buildings,
only “light” infrastructure is allowed, such as moorings and/or small docks (for 2-3 boats), platforms (use environmental friendly construction material), no massive sports and no massive tourism infrastructure).

SUSTAINABLE DEVELOPMENT ZONE

The area has a satisfactory nature performance. It include the park area from Kepi i Shen Vasilit till Kepi i Gjuhezes. The priority is harmonizing biodiversity, nature and landscape protection by coordinating protected area management with sustainable socio-economic development.

Among the main goals of this zone is also to provide economic benefits and contribute to the improved livelihood of local people by using natural goods and services or benefits coming from appropriate forms of tourism. Along with socio-economic development, the zone should maintain and preserve necessary habitat condition for the protection of species, groups of species, biotic communities or physical features of the environment that require special human intervention for an effective management.

ALLOWED ACTIVITIES

Sailing swimming and snorkelling, anchoring, mooring, kayaking, water sports, and visitation.

NOT ALLOWED ACTIVITIES

It is strictly not allowed to perform the following activities within the Recreational Zone: maritime traffic, mineral extraction, and collection of plants, minerals, stones, paleontological findings, development of aquaculture and any military activities.

REGULATED ACTIVITIES

The following activities can be performed after a special permit is issued by the PA administration: scientific research and monitoring, diving only guided tours, limited number of divers, and traditional fishing is allowed, wildlife watching, infrastructure development infrastructure development should be in accordance wh Development Plans and Management Plan.

Sources:
INCA (2013) Strategic Plan for Marine and Coastal Protected Areas (SPMCPAs). GEF/UNDP. Tirana, IUCN (2014) The IUCN Red List of Threatened Species, UNDP/GEF and Ministry of Environment (2005c) Karaburun, Tilot V. (2009) Proposal for a Marine Protected Area in Albania. GEF, UNDP, Puka M. (2012) Socio-Economic Study of MCPA Karaburun-Sazani. GEF/UNDP. Tirana.

LAGUNA E NARTËS
2.9

NARTA LAGOON

The Lagoon of Narta (Albanian: Laguna e Nartës) is a lagoon of the Adriatic Sea on the Mediterranean Sea in the central coast of Albania. The lagoon extends north of the Bay of Vlorë on the eastern shore of the Strait of Otranto and is separated from the sea by a narrow littoral strip, consisting of an alluvial dune. It has a surface area of 41.8 km2 (16.1 sq mi) with a maximal depth of 1.5 m (4.9 ft).

It is situated within the boundaries of the Vjosa-Narta Protected Landscape and has been recognised as an important Bird and Plant Area of international importance. As of May 2020, it is home to 3,000 flamingos. It is formed by the constant accumulation of solid flow of the Vjosa River, which originates within the Pindus Mountains close to the border between Albania and Greece.

The lagoon is named after the village of Nartë, which is found on the lagoon's southern shores. Within the lagoon, there are two islands located, with Zvërnec Island being the largest. A wooden footbridge connects mainland to the island, where a 13th-century monastery is located. At least 34,800 wintering birds can be counted on the lagoon.

It is unfortunately also the proposed site for the new international airport despite the enormous range of endemic biodiversity and protected status of the same.

(Author; Multiple Sources)

Map by Author

Coastal Beaches

Elevated Dune Corridors

Beaches

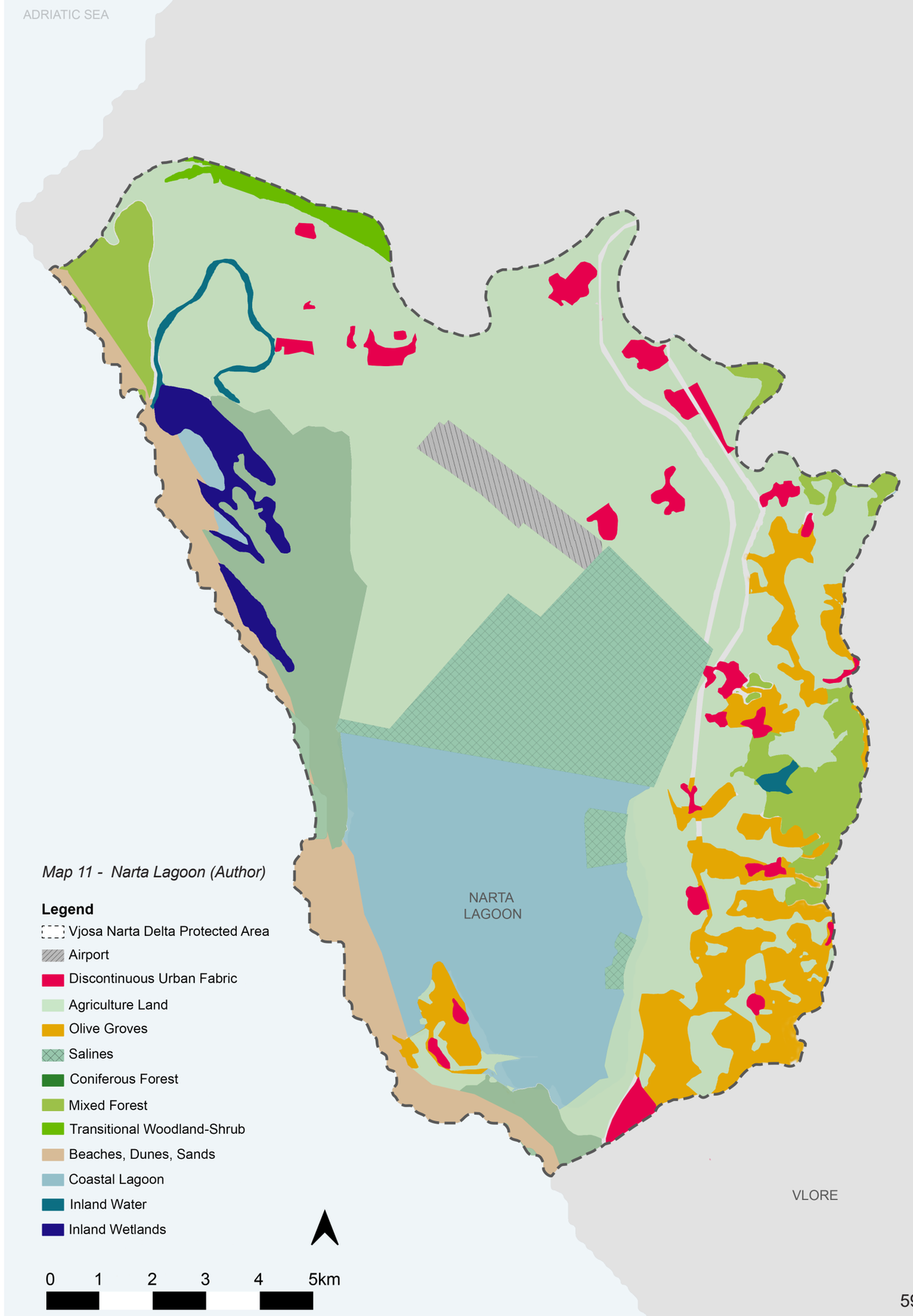
Wetlands & Lagoon

Salty Coastal Lakes

Lowlands & Hilly Areas

Fluvio Alluvial Sediments

Sediment Deposits



Map 11 - Narta Lagoon (Author)

MOLLUSCS

In the Narta lagoon about there are present about 32 mollusks, most widespread are the gastropods Cyclope neritea, Ventrosia ventrosa & Pirenella conica (PPNEA Albania ©).

Figure 73 - Cyclope neritea

Figure 74 - Ventrosia ventrosa

Figure 75 - Pirenella conica

FISH

The river Vjosa and its delta as well as the lagoon of Narta are important for the fish diversity in the region and crucial for fishing and aquaculture. About 39 fish species have been recorded in the area. The lagoon is used for fishing mainly by local people from the surrounding villages of Narta and Zverneci. Chelon labrosus, Dicentrarchus labrax, & Atherina hepsetus. (PPNEA Albania ©).

Figure 76 - Chelon labrosus

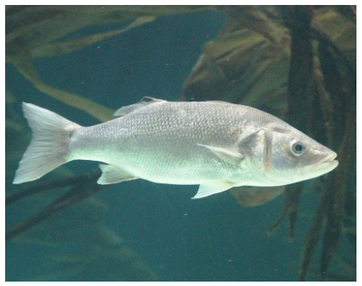


Figure 77 - Dicentrarchus labrax

Figure 78 - Atherina hepsetus

MAMMALS

From the total number of 74 mammal species registered in Albania, about 32 species to be present in the Vjosa-Narte area. Lagomorpha, Insectivora, (PPNEA Albania ©).

Figure 79 - A hare

Figure 80 - Hedgehog

Figure 81 - Bat

BIRDS

The area of Narta is listed as the second most important site for water birds in Albania after the Karavasta area. About 80 species have been recorded (look at annex 4). More than 90% of them prefer the less disturbed central part of the lagoon. Ducks (Anas sp.) and coot (Fulica atra) are the most abundant with 47% equal to 18000 individuals and 35% with 13500 individuals, respectively. The lagoon is known as the main wintering site in Albania for many birds. (PPNEA Albania ©)

Figure 82 - Anas acuta

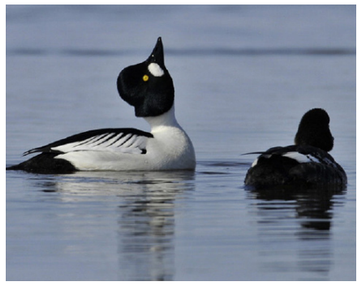


Figure 83 - Bucephala clangula

Figure 84 - Charadrius alexandrinus

Figure 85 - Numenius tenuirostris

Figure 86 - Pluvialis squatarola

Figure 87 - Tadorna tadorna

ENDANGERED LIST

Species	Endangered Nationally	Endangered Globally	Protection Status	Total Types
Molluscs	12	23	-	>32
Insects	57	1	28	>287
Crustaceans	9	-	-	>61
Echinoderms	6	-	-	>6
Fishes	16	5	1	>102
Amphibians	9	2	5	>9
Reptiles	23	5	20	>26
Birds	43	4	52	>194
Mammals	14	9	12	>32
Total	189	26	118	>749

Table7 - Endangered List

3. ENVIRONMENTAL SYSTEMS

EKOSISTEME
3.1

ECOSYSTEMS

Vlora Region is predominantly hilly and mountainous, while the farthest north-western part and the Shushica valley area are predominantly flat. A wide mountainous area lays south of Vlora city to Qeparo and Borsh. The highest peak in this area is the Cika mountain (2.045 m), located approximately on the same latitude of the Commune of Vranisht. Novosela plain, Delvina district and other hill areas and river valleys are generally characterised by fertile soil and good agricultural lands.

The Region is very rich in underground water reserves. One of the most remarkable springs is the Blue Eye spring, with a capacity of 14 m3/sec, located in the Delvina district. The seashore of the Region is part of the Vlora and Saranda districts, whilst Delvina district has no access to the sea.

From Vjosa river to Vlora city, the shore is constituted by a sedimentation area with very interesting ecosystems such as the dunes around the outfall of Vjosa and the wetlands of Narta Lagoon.

From the south of Vlora downtown to the border with Greece, the shore is constituted by a rugged erosion line on the whole, with gulfs, bays, beautiful beaches and rocky landscape underwater. In front of big and small built-up areas, the quality of the sea water is often low because of the pollution mainly due to the lack of urban wastewater treatment.

Estuary
1

Inland Waters
2

Wetlands
3

River
4 13 15

Lagoon
5 6 14

Forest
8 16 18

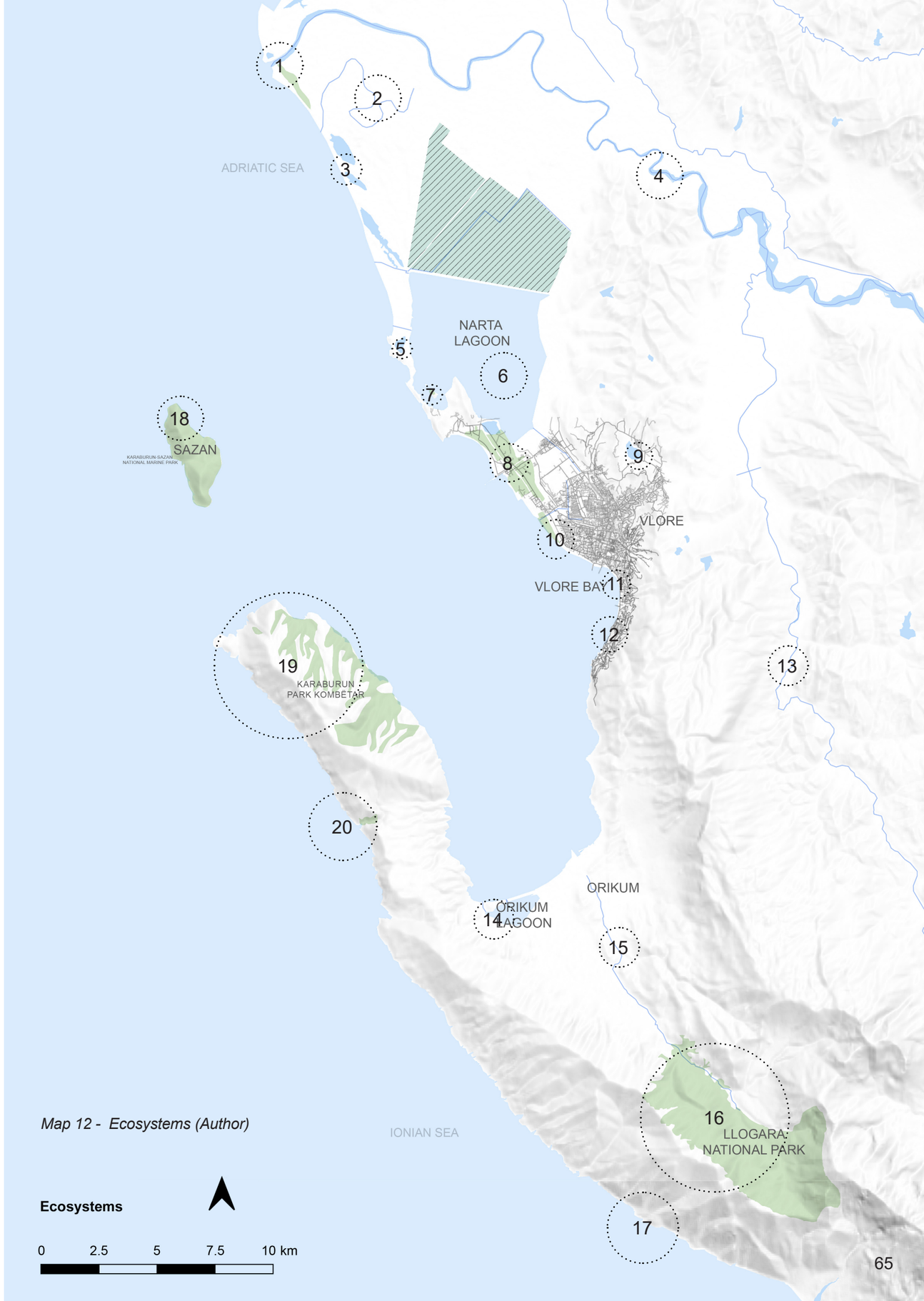
Cliffed Coast
17 19 20

Island
7 18

Sea

Over 13 diverse ecosystems have been identified through study of the broader Vlore region.

Map & data summarized by Author.



Map 12 - Ecosystems (Author)

The Region is rich in lagoons: Narta Lagoon in the north and Butrint Lagoon in the south are both protected areas, while Orikum Lagoon, near the homonym town, is the only wetland area not included in the Albanian protected areas network. Moreover, the increase of Mediterranean crabs and the change of alga communities could be interpreted as effects of the eutrophization of the whole lagoon system.

Many rivers of the Region have a seasonal regime and, in the past, in their flood time, they flooded the areas around their beds.Nowadays, through the building of adequate dams, their flows are more controlled. However, rivers are now threatened by the lack of waste management systems. Large intervals of river banks are polluted by uncollected and burned garbage. The existence of dumping grounds that burn, especially at night, both in urban peripheral and in wild areas, also makes the presence of air pollution by dioxin very likely.

Studies identified 13 ecosystems in the Region, and classified them according to one of the most important characteristics of an ecosystem: its productivity.

This reveals to a large extent the condition of a particular ecosystem and different systems can be compared directly on the basis of their productivity. The process of building an organic matter in an ecosystem depends closely on the availability and movement of energy through the system and the movement is ultimately driven by solar energy.

Therefore, ecosystems have been considered as biological communities and classified on the basis of their Gross Primary Productivity (GPP) The GPP of a biological community is the amount of energy produced through photosynthesis, per unit area and time, by the plants, since they are the primary producers.

IDENTIFIED ECOSYSTEMS

GPP (x 10^3) (kcal/m^2)	Typology	Sites
Negative GPP (GPP < 0)	Urban areas	• Downtown Vlora • Downtown Saranda
Low GPP (0 < GPP < 0.5)	High mountain areas	• Çika Mountain (Llogara National Park, higher than 1.500 m a.s.l.)
Medium GPP (0.5 < GPP < 3.0)	Mountain forests	• Llogara National Park (from 500 m to 1,500 m a.s.l.) • Cape Karaburun (more than 500 m a.s.l.) • Southern Shushice Valley (more than 500 m a.s.l.) • Northern Delvina district (more than 500 m a.s.l.) • Northern Saranda district (more than 500 m a.s.l.)
	Mediterranean maquis	• Generally spread
	Dunes	• Area of Vjosa River outfall
	Sea coastal waters	• Vlora coast • Saranda coast
High GPP (3.0 < GPP < 10.0)	Forests	• Generally spread in eastern side of Vlora district (up to 500 m a.s.l.) • Cape Karaburun (up to 500 m a.s.l.) • Southern Shushice Valley (up to 500 m a.s.l.) • Northern Delvina district (up to 500 m a.s.l.) • Northern Saranda district (up to 500 m a.s.l.)
	Agricultural lands (small production)	• Plain of Novoselë • Southern Delvina district • Other hill areas • Other fluvial plans and valleys
	Not very deep lakes	• Bistrica artificial basin • Other artificial lakes
	Rivers	• Vjosa River • Shushice River • Bistrica River
	Lagoons	• Narta Lagoon • Orikum Lagoon • Butrint Lagoon
Very high GPP (10.0 < GPP < 25.0)	Agricultural lands (industrial production)	• South Delvina
	River outfalls	• Vjosa River outfall • Bistrica River outfall

Table8 - Identified Ecosystems

LLOGORA NATIONAL PARK

This park is situated approximately 40 kilometres southeast of Vlora city, between the Adriatic and Ionian Sea. The trees in this area have distinctive crowns, shaped by the winds. A peculiar tree is “The Flag Pine”, which is a rare natural monument with relevant scientific value, visited by many tourists. From the pass of Llogora, about 3 kilometres west, the Ionian Sea can be clearly seen. This park has indisputable values and its climate is a good combination of fresh mountain and sea air. Llogora National Park is also a very suitable location for air sports.

SAZAN

Sazan is the largest island in Albania, located on the northwest side of the peninsula of Karaburun, about 12 miles from Vlora harbour. It has an area of 5.7 km, 4.5 km length and 2 km maximal width. In ancient times it was called Sason. The island has the shape of a rocky block with sharp coasts especially in its the western part. In the southeast part is located the sandy Admiral beach, which is known for its very clean water. Both Sazani and Karaburun are particularly renowned for diving.

KARABURUN

The peninsula of Karaburun is located in the western side of Vlora bay. It is the largest peninsula in Albania, about 16 km long and 4.5 km wide. In the north of Karaburun is found the cave of Haxhi Ali, the largest cave of the country. It is 30 meters deep, 18 meters high and 12 meters wide. These sizes allow the entrance of boats. The cave was named after a sailor from Ulqin, who sailed in these waters during the XVII century. The peninsula hosts many small beaches such as Arusha bay, Grama and Dafina beaches, that are all well known for their deep and high quality waters. Near Grama beach there is the Cave of Slaves. On the walls of Grama’s beach there are ancient graffiti. The western part of Karaburun is one of the most attractive points of Albanian coast for the diving fans.

Figure 88 - Llogora national Park

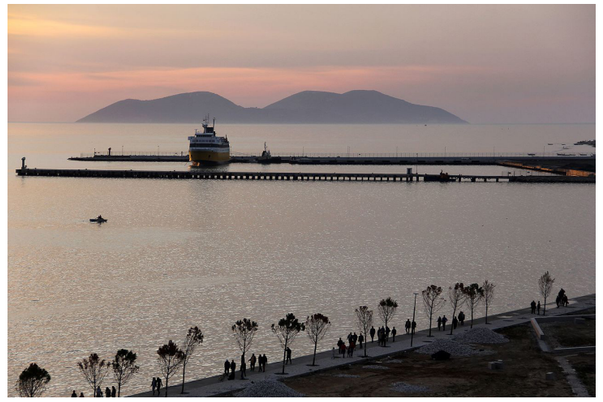


Figure 89 - Vlora Bay

Figure 90 - Karaburun

EKOTONET
3.2

ECOTONES

An ecotone is a transition area between two biological communities, where two communities meet and integrate. It may be narrow or wide, and it may be local (the zone between a field and forest) or regional (the transition between forest and grassland ecosystems). An ecotone may appear on the ground as a gradual blending of the two communities across a broad area, or it may manifest itself as a sharp boundary line.

There are several distinguishing features of an ecotone. First, an ecotone can have a sharp vegetation transition, with a distinct line between two communities.For example, a change in colors of grasses or plant life can indicate an ecotone.

Second, a change in physiognomy (physical appearance of a plant species) can be a key indicator. Water bodies, such as estuaries, can also have a region of transition, and the boundary is characterized by the differences in heights of the macrophytes or plant species present in the areas because this distinguishes the two areas' accessibility to light.

Third, a change of species can signal an ecotone. There will be specific organisms on one side of an ecotone or the other.

Other factors can illustrate or obscure an ecotone, for example, migration and the establishment of new plants. These are known as spatial mass effects, which are noticeable because some organisms will not be able to form self-sustaining populations if they cross the ecotone.

Map & Description by Author

1

Figure 91 - Ecotone a

2

Figure 92 - Ecotone b

3

Figure 93 - Ecotone c

4

Figure 94 - Ecotone d

5

Figure 95 - Ecotone e

6

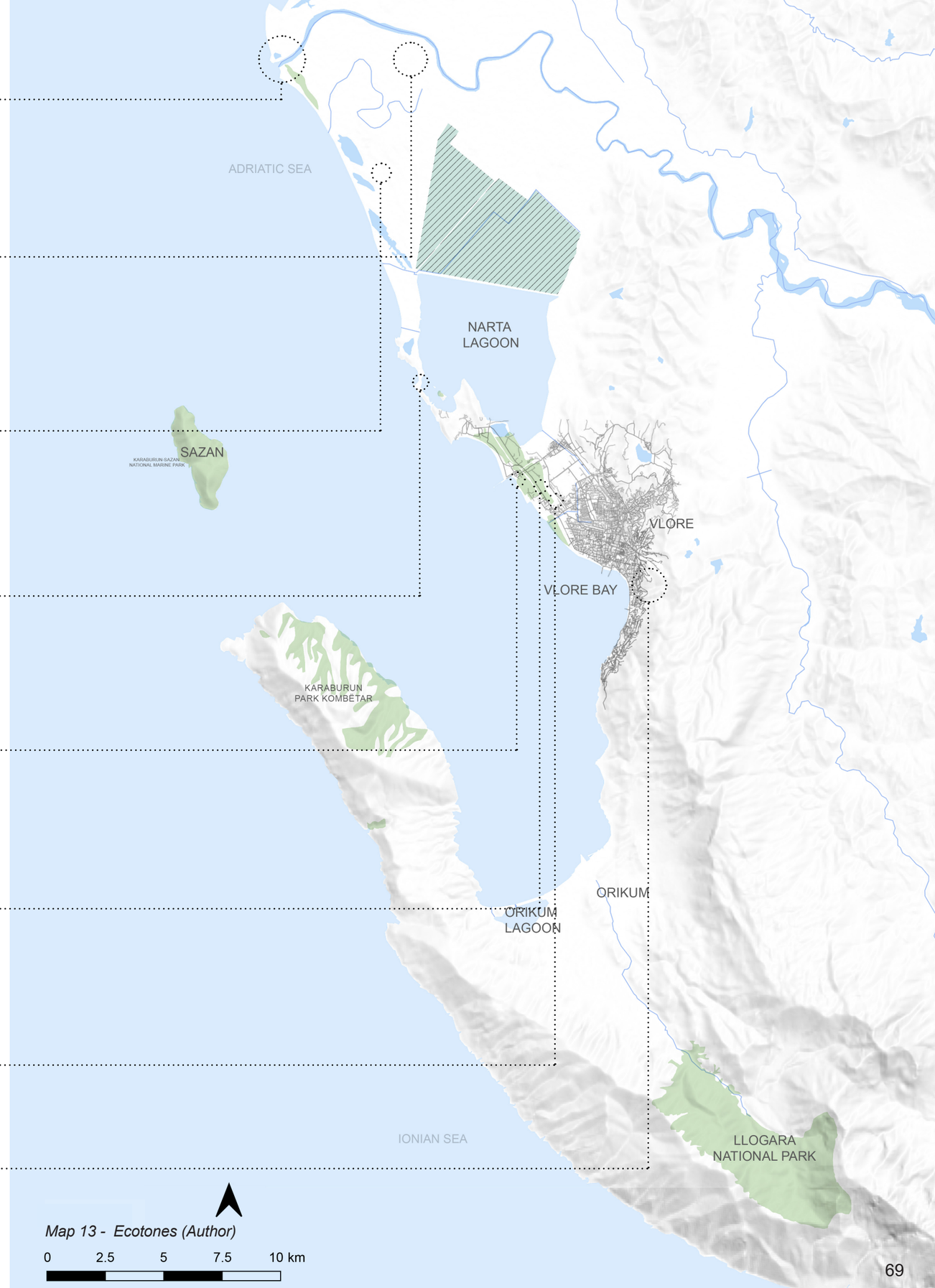
Figure 96 - Ecotone f

7

Figure 97 - Ecotone g

8

Figure 98 - Ecotone h



Map 13 - Ecotones (Author)

EKOSISTEME URBANE
3.3

URBAN ECOSYSTEMS

With the new Boulevard in Vlora, the second largest port city of Albania, an important node of the city that was far from using its great potential of becoming the lively heart of Vlora. Here one can find everything the city needs; from bars, shops, and restaurants to theatres, mosques, the University and the stadium.

On the city-side of these public spaces is the redesigned road (3,2km) with much improved traffic flow and more importantly a better pedestrian porosity. The redesign makes it possible to keep the existing old palm trees and integrate the first dedicated bicycle path of Vlora. Along the road the new esplanade (2,6 km, 21m wide) was created in a flexible way to be used either a a terrace and bar area or a terrace area combined with parking spaces.

The city of Vlores rapid development has led to an increase in rubbish production, further exacerbated by the difficulties faced by local institutions in guaranteeing an adequate collection system, especially in rural and peripheral areas, and by the lack of environmental sensitivity by many residents who still dump materials of various type in public spaces.

The close proximity of the industrial zone, landfill , the petroleum depot , Soda forest, water channels draining into the sea with high levels of toxicity has greatly impacted the environment and reduced the quality of the local ecosystem.

The growing amount of plastic and metal waste has on the other hand created opportunities for the poorest sections of the population, who manage to earn a living by collecting and selling recyclable materials, thus reducing the amount of waste that ends up in landfills and improving recycling processes.

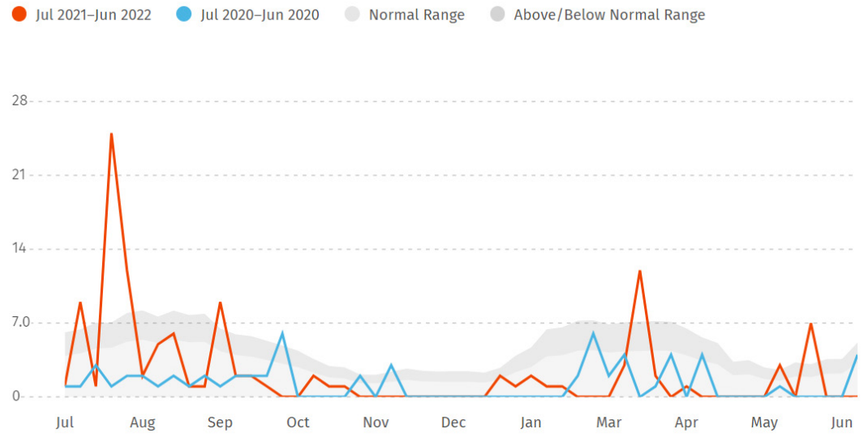
Author

Figure 99 - The Ismail Qemali Boulevard.

Figure 100 - The City Beach along the promenade.

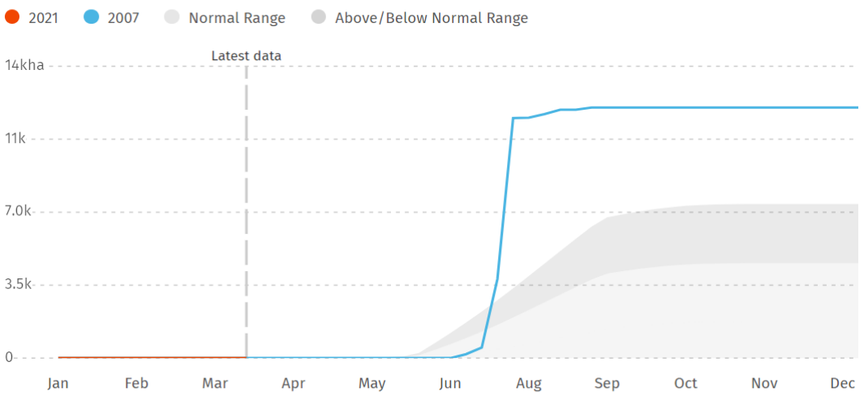
Figure 101 - The pedestrian and cycling path acrosss the promendae lined with palm trees.

Map 14 - Urban Ecosystems (Author)



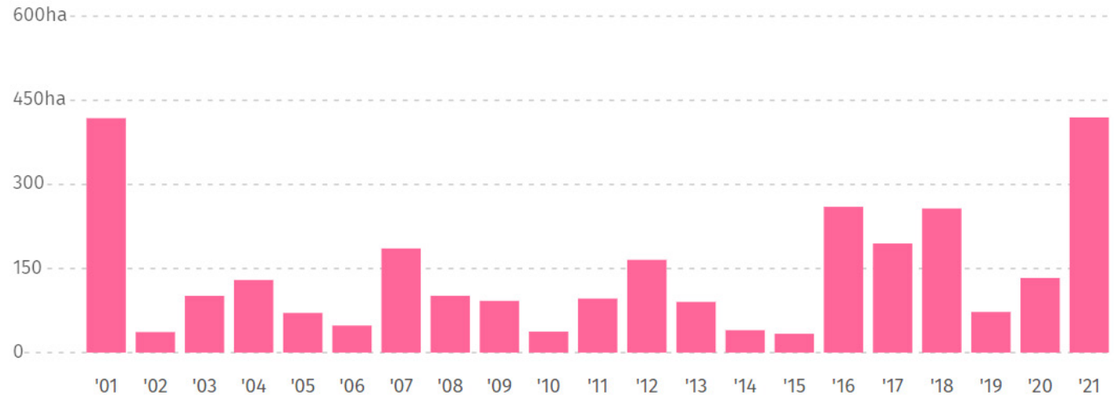
In Vlorës the peak fire season typically begins in early February and lasts around 28 weeks. There were 116 VIIRS fire alerts reported between 5th of July 2021 and 27th of June 2022. This is unusually high compared to previous years going back to 2012.

Graph 1 - Global Forest Watch. "Fires in Vlorës, Vlorë, Albania". Accessed on 29/06/2022 from www.globalforestwatch.org.



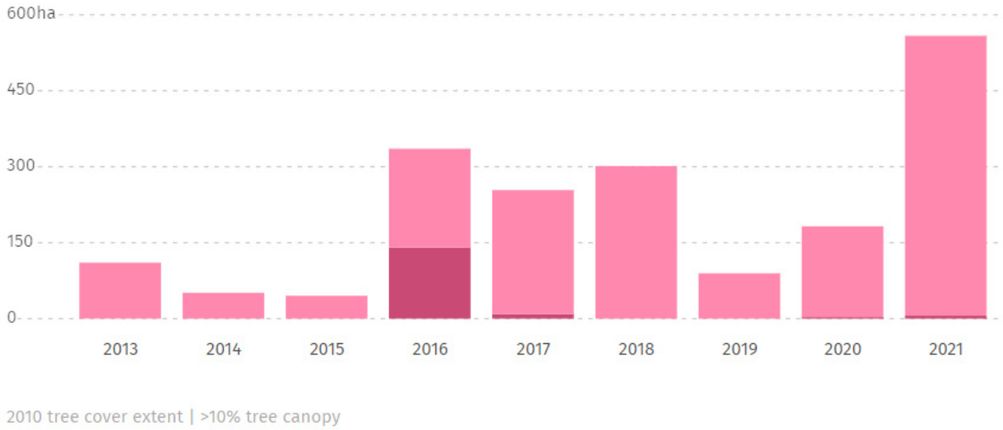
In Vlorës, 0ha of land has burned so far in 2021. This total is unusually low compared to the total for previous years going back to 2001. The most fires recorded in a year was 2007, with 12kha.

Graph 2 - Giglio, L. et al. (2018). "Monthly MODIS Burned Area Product (MCD64A1 v006)." Accessed on 29/06/2022 from Global Forest Watch.



From 2001 to 2021, Vlorës lost 2.98kha of tree cover, equivalent to a 12% decrease in tree cover since 2000.

Graph 3 - Global Forest Watch. "Tree cover loss in Vlorës, Vlorë, Albania". Accessed on 29/06/2022 from www.globalforestwatch.org.



From 2013 to 2021, 92% of tree cover loss in Vlorës occurred within natural forest. The total loss within natural forest was equivalent to 431kt of CO_2 emissions.

Graph 4 - Global Forest Watch. "Forest loss in natural forest in Vlorës, Vlorë, Albania". Accessed on 29/06/2022 from www.globalforestwatch.org

INDUSTRIAL PLANTS

The former Uzina PVC industrial plant was located four kilometres from the north of Vlorë, next to the Soda Forest and to an oil storage plant (Petrolifera Italo-Albanese). Uzina PVC included three chemical substance production units (chlorine, vinyl chloride, and polyvinyl chloride) (UNEP, 2000).

According to the data provided in the analytical framework of the Vlorë General Town Plan, this plant dumped directly into the sea approximately 500 m3/h of liquid waste with a high mercury content (Municipality of Vlorë, 2017).

The sludge dumped into the sea heavily polluted the nearby beaches and the Gulf of Vlorë,contributing to the enlisting of the area among the nine most polluted sites in Albania (Municipality of Vlorë, 2017).

During the on-field analysis, a high number of dwellings were observed next to the illegal dumps of toxic waste or near the only authorised dumping ground for mercury waste materials. There are some vegetable patches in these polluted soils and it is common to see livestock grazing on the dumps.

In 2002, following the UNEP/MAP1 mission, the area was identified as an environmental 'hot spot' due to the high levels of mercury, which was over 1,000 times greater than the level permitted by the European Union (EDEN-CRCD, 2018). The polluted area was partially decontaminated following the agreement/concession between the Albanian State and the Petrolifera Italo-Albanese company2 (2004).

Surveys carried out in 2018 confirm a high level of pollution, which seriously threatens the health of the inhabitants and hinders the prospects for the development of tourism in the area (EDEN - CRCD, 2018).

The Municipality of Vlorë, thanks to recent funding from the European Union, has approved a decontamination and site-rehabilitation project with an estimated cost of 3 million Euros. The project also envisages alternative housing for the people living in the former industrial plant (Municipality of Vlorë, 2017).

Figure 102 - The square at Zvernec.

Figure 103 - Remnants of Uzina PVC plant.

Figure 104 - Petrolifera Italo-Albanese

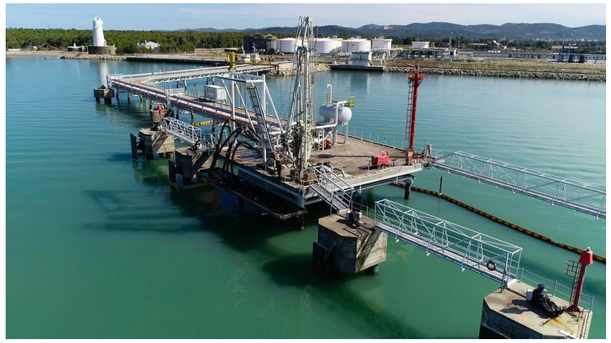


Figure 105 - The port access to the petroleum depot.

Figure 106 - Narta Lagoon. (Celim)

Figure 107 - Mercury Landfill (Author)

Figure 108 - Dump Site, Soda forest. (Author)

Figure 109 - Toxic discharge to the Adriatic through the water channels. (Author)

Figure 110 - Failed erosion measures at the beach, Soda forest. (Author)

Figure 111 - The landfill by the city & Soda forest. (Author)

Figure 112 - Dump site & toxic discharge at the estuary into the Adriatic, Soda forest. (Author)

Figure 113 - A member of the Roma miniority collecting recyclable waste, Vlore. (Author)

RESILENCA
3.4

COASTAL ARTIFICIALIZATION

The Albanian coastal ecosystems are under a significant pressure. Risks are connected with lost of biodiversity and natural habitats, that play an important role in the health of humans, food chain and in the availability of the natural resources on economic development. Based on a study made from UNDP and INCA for the strategic plan related with the protected areas, this situation comes as a consequence of the combination of several factors:

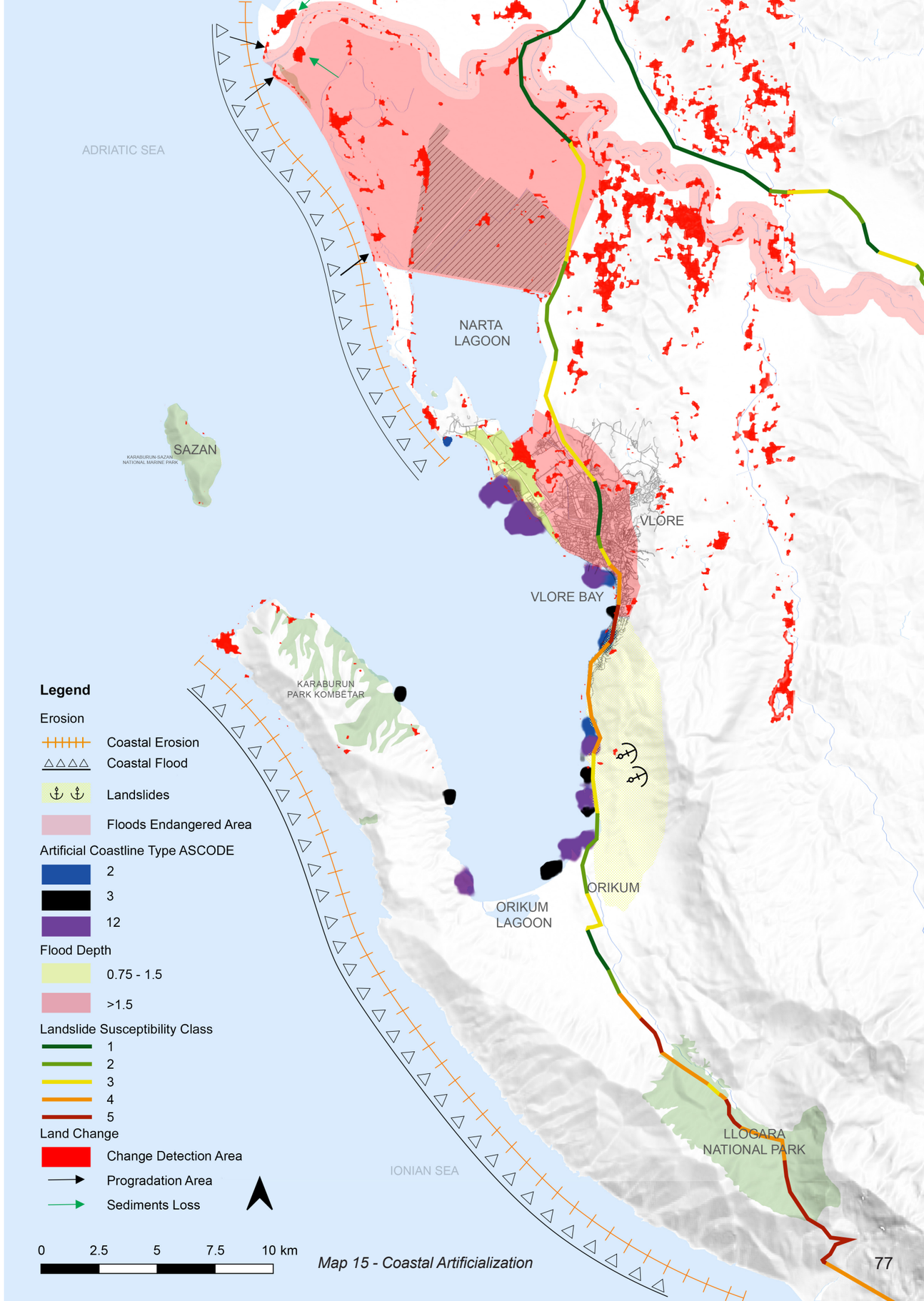
Inert wastes have had a considerable decrease as a consequence of closure of many industries,but there is seen an increase in urban waste caused from tourism development, especially in the coastal zones of AdriaticSea.

Coastal development from tourism and related urbanization is intensified in the recent years. This has brought an increase in population number which leads to: ecosystems degradation; increase in erosion; dumping of sewage in the sea due to the lack of adequate construction of sewage networks; and loss and fragmentation of natural habitats while endangering speciesthat are near extinction.

Aquaculture development, which can bring significant losses in the marine habitats. Use of antibiotics and retention of faeces matter, impacts the quality of water by actually reducing it.

Climate change and its consequences. For instance: the global sea level based on the projections, is predicted to increase by 0.28-0.98 metres. Only this effect of climatic change will bring big consequences in the coastal areas through loss of land territories, destruction of ecosystems and the impact it has in the economic activities of coastal cities and villages. Some of these changes are: increase of air temperature and marine surface area; average changes and extreme rainfall; changes in the frequency and intensity of storms; increase of sea level.
(Author)

Map by Author compiled from multiple sources.



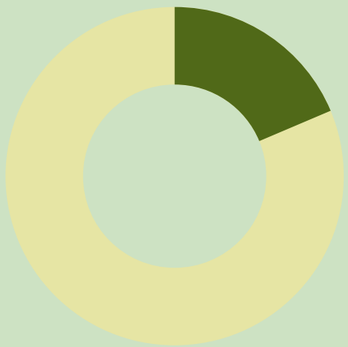
Map 15 - Coastal Artificialization

MBULESA E PEMËS 3.5

TREE COVER

Shows the 2000 or 2010 extent of tree cover, defined as all vegetation taller than 5 meters in height, in the selected area.

The tree cover data set is a collaboration of the University of Maryland, Google, USGS, and NASA, and uses Landsat satellite images to map tree cover globally for the years 2000 and 2010 at 30-meter resolution. Note that “tree cover” is the biophysical presence of trees and may take the form of natural forests or plantations existing over a range of canopy densities.



NATURAL FOREST
31.8 kha

PLANTATIONS
450 ha

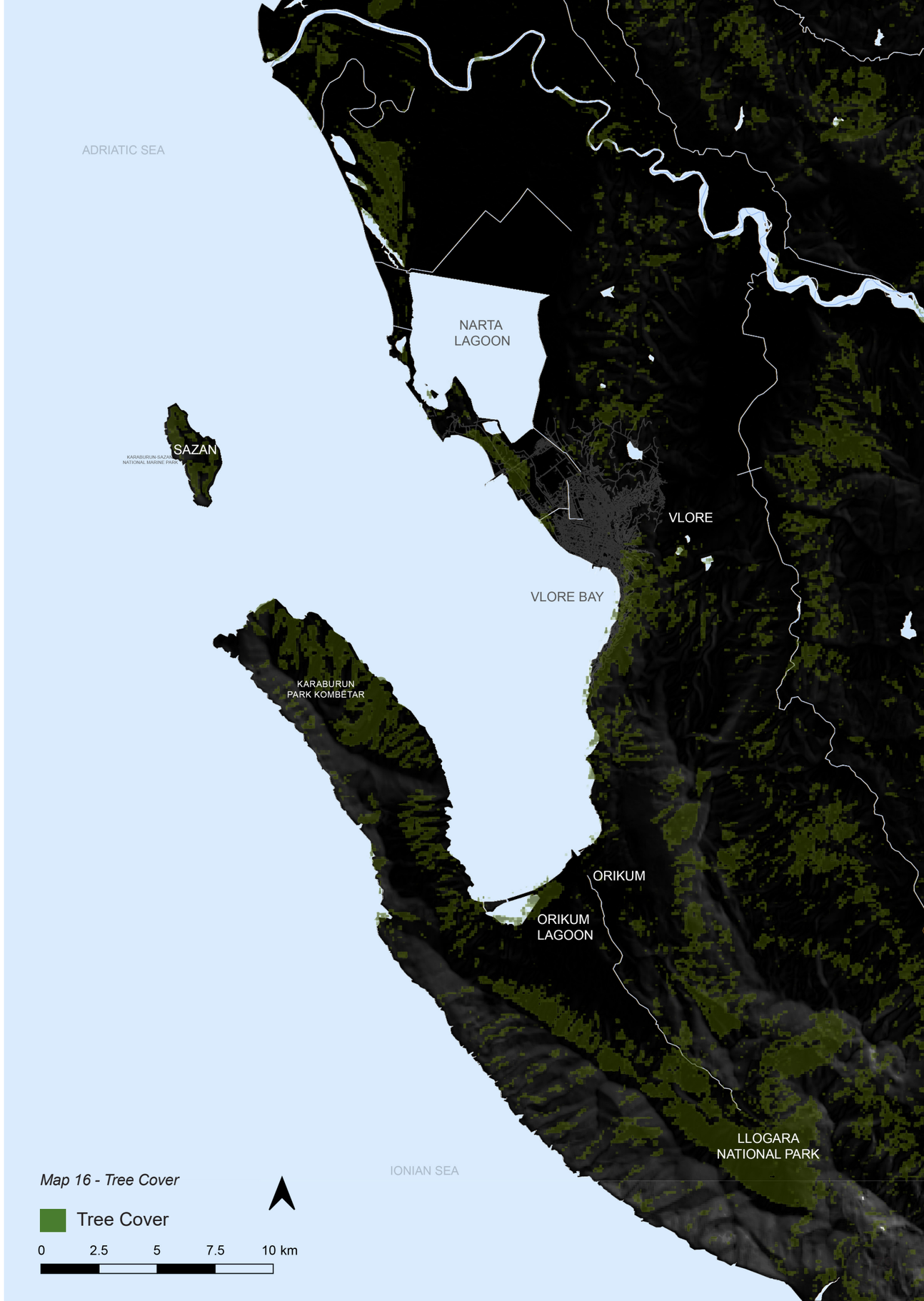
NON FOREST
129 kha

>10% Tree Canopy

Source:
https://glad.umd.edu/dataset/global-2010-tree-cover-30-m) Hansen/UMD/Google/USGS/NASA

Global Forest Watch. “Tree cover in Vlorës, Vlorë, Albania”. Accessed on 05/02/2022 from www.globalforestwatch.org.

Map by Author



Map 16 - Tree Cover

Tree Cover

0 2.5 5 7.5 10 km

MBULESA E PEMËS 3.5.1

TREE COVER LOSS

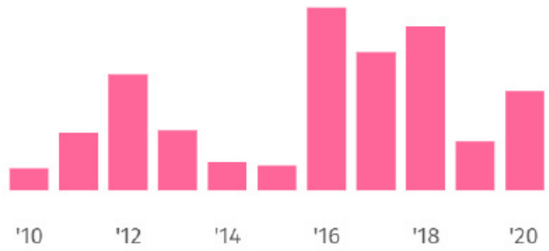
Shows year-by-year tree cover loss, defined as stand level replacement of vegetation greater than 5 meters, within the selected area. The tree cover loss data set is a collaboration of the University of Maryland, Google, USGS, and NASA, and uses Landsat satellite images to map annual tree cover loss at a 30 × 30 meter resolution.

Note that **“tree cover loss”** is not the same as **“deforestation”** – tree cover loss includes change in both natural and planted forest, and does not need to be human caused. The data from 2011 onward were produced with an updated methodology that may capture additional loss. Comparisons between the original 2001-2010 data and future years should be performed with caution.

TREE COVER GAIN

Tree cover gain is defined as the establishment of tree canopy at the Landsat pixel scale in an area that previously had no tree cover. The tree cover gain data set is a collaboration of the University of Maryland, Google, USGS, and NASA, and uses Landsat satellite images to map gain at 30-meter resolution.

Note that **“tree cover”** is the biophysical presence of trees and may take the form of natural forests or plantations existing over a range of canopy densities. The tree cover loss and tree cover gain data sets were produced for different time periods and with different methodologies, and so should not be compared against each other to determine “net” change.



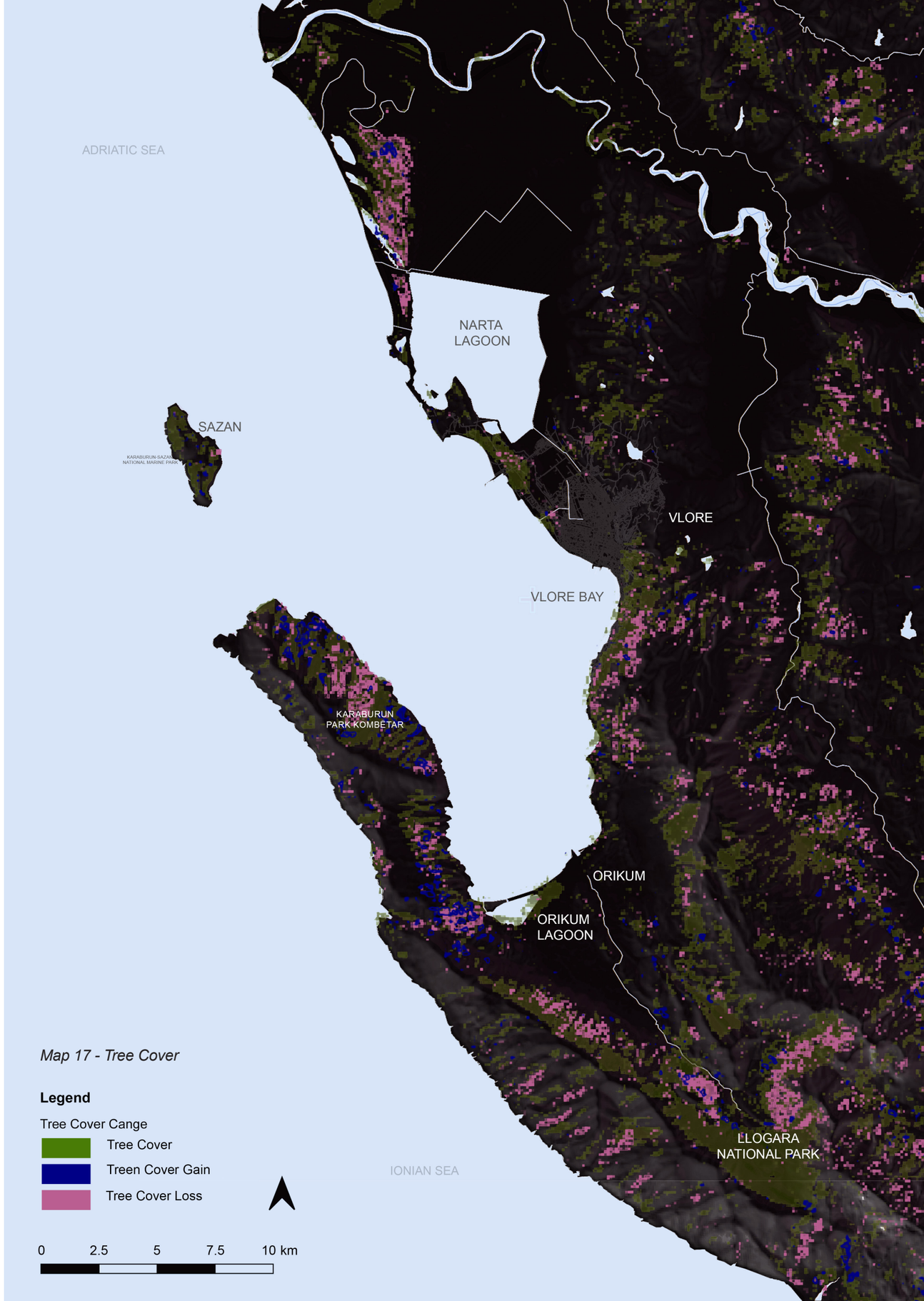
From 2001 to 2012, Vlorës gained 646ha of tree cover region-wide equal to 75% of all tree cover gain in Vlorë.

Graph 5 - Tree Cover Gain

Source:
Global Forest Watch. “Tree cover loss in [country/province name]”. Accessed on 05/02/2022 from www.globalforest-watch.org.

Global Forest Watch. “Tree cover gain in Vlorës, Vlorë, Albania compared to other areas”. Accessed on 05/02/2022 from www.globalforestwatch.org.

Map by Author



Map 17 - Tree Cover

MBULESA E PEMËS 3.6

FOREST CARBON EMISSIONS

Forest carbon emissions represent the greenhouse gas emissions arising from stand-replacing forest disturbances that occurred in each modeled year (megagrams CO2e ha-1, between 2001 and 2020). Emissions include all relevant ecosystem carbon pools (aboveground biomass, belowground biomass, dead wood, litter, soil) and greenhouse gases (CO2, CH4, N2O).

This emissions layer is part of the forest carbon flux model described in Harris et al. (2021), which introduces a geospatial monitoring framework for estimating global forest carbon fluxes which can assist governments and non-government actors with tracking greenhouse gas fluxes from forests and decreasing emissions or increasing removals by forests.

CO2 Released
+36.1 kt CO2e

Source:
Harris, N.L., D.A. Gibbs, A. Baccini, R.A. Birdsey, S. de Bruin, M. Farina, L. Fatoyinbo, M.C. Hansen, M. Herold, R.A. Houghton, P.V. Potapov, D. Requena Suarez, R.M. Roman-Cuesta, S.S. Saatchi, C.M. Slay, S.A. Turubanova, A. Tyukavina. 2021. Global maps of twenty-first century forest carbon fluxes. Nature Climate Change. https://doi.org/10.1038/s41558-020-00976-6Harris et al. (2021). Global maps of 21st century forest carbon fluxes. Accessed on 05/02/2022 from Global Forest Watch.

Map by Author

Map 18 - Forest Greenhouse Gas Emissions

HEQJA E KARBONIT

3.6.1

FOREST CARBON REMOVALS

Forest carbon removals from the atmosphere (sequestration) by forest sinks represent the cumulative carbon captured (megagrams CO2 ha-1) by the growth of established and newly regrowing forests during the model period between 2001-2020. Removals include accumulation of carbon in both aboveground and belowground live tree biomass.

This carbon removals layer is part of the forest carbon flux model described in Harris et al. (2021). This paper introduces a geospatial monitoring framework for estimating global forest carbon fluxes which can assist governments and non-government actors with tracking greenhouse gas fluxes from forests and decreasing emissions or increasing removals by forests.

CO2 Absorbed
-111 kt CO2e

Source:
Harris, N.L., D.A. Gibbs, A. Baccini, R.A. Birdsey, S. de Bruin, M. Farina, L. Fatoyinbo, M.C. Hansen, M. Herold, R.A. Houghton, P.V. Potapov, D. Requena Suarez, R.M. Roman-Cuesta, S.S. Saatchi, C.M. Slay, S.A. Turubanova, A. Tyukavina. 2021. Global maps of twenty-first century forest carbon fluxes. Nature Climate Change. https://doi.org/10.1038/s41558-020-00976-6
Harris et al. (2021). Global maps of 21st century forest carbon fluxes. Accessed on 05/02/2022 from Global Forest Watch.

Map by Author

Map 19 - Forest Carbon Removals

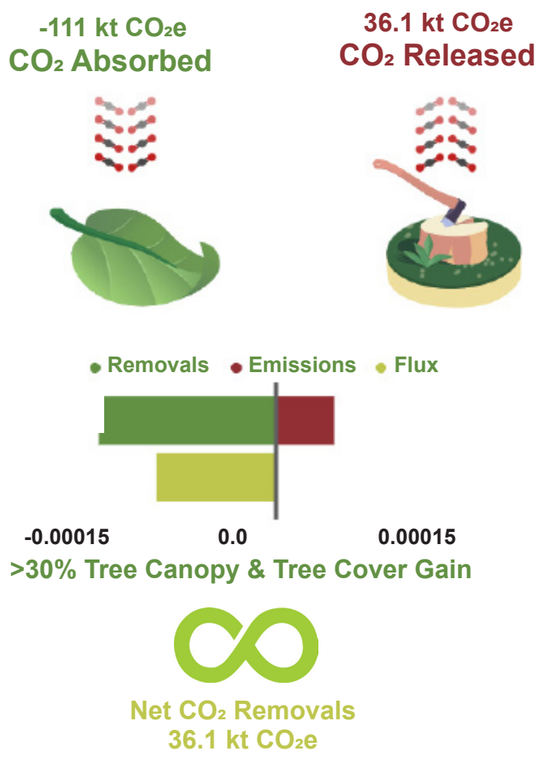
HEQJA E KARBONIT

3.6.2

NET FOREST CARBON FLUX

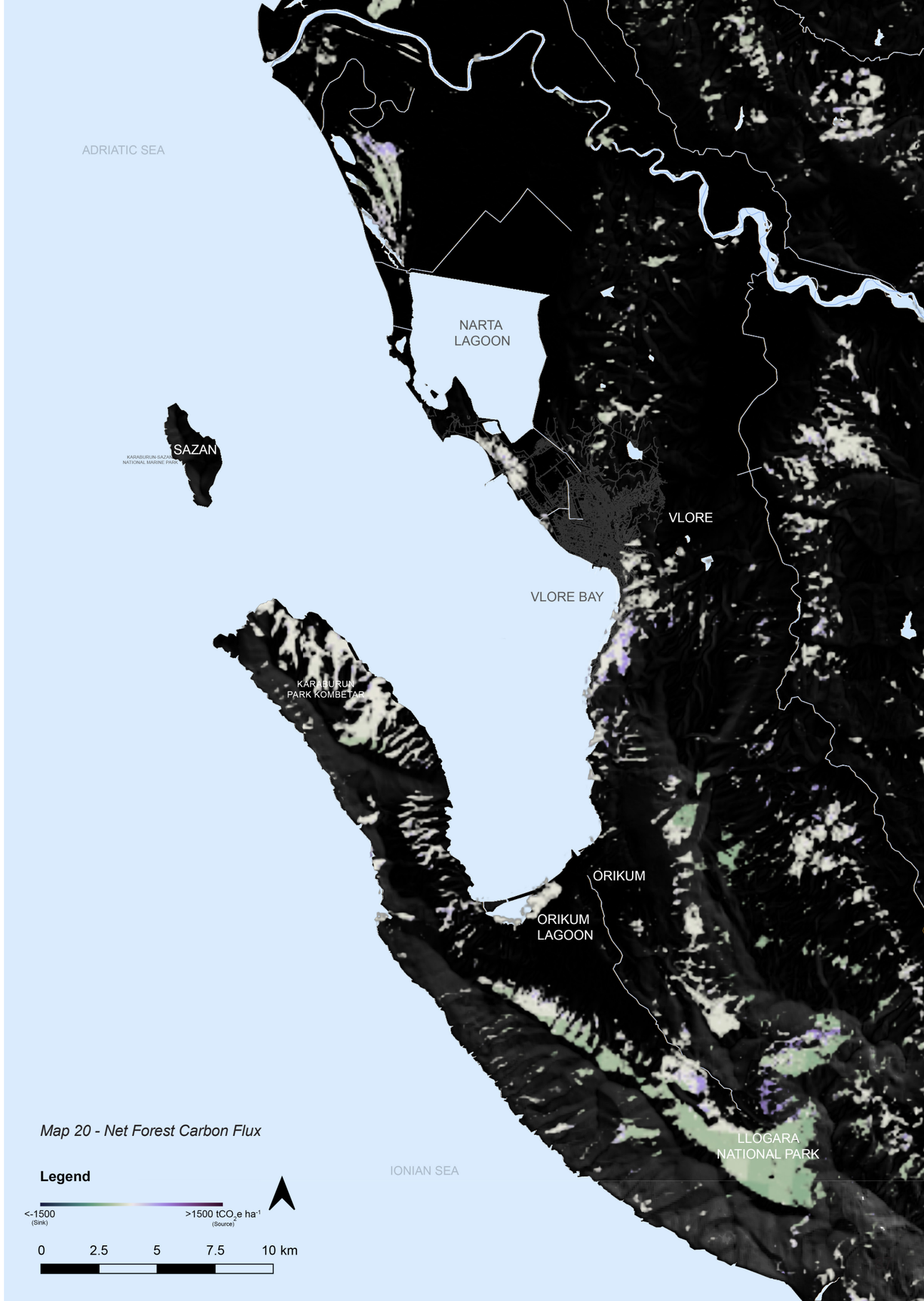
Net forest carbon flux represents the net exchange of carbon between forests and the atmosphere between 2001 and 2020, calculated as the balance between carbon emitted by forests and removed by (or sequestered by) forests during the model period (megagrams CO2e ha-1).

Net carbon flux is calculated by subtracting average annual gross removals from average annual gross emissions in each modeled pixel; negative values are where forests were net sinks of carbon and positive values are where forests were net sources of carbon between 2001 and 2020.



Source:
Harris, N.L., D.A. Gibbs, A. Baccini, R.A. Birdsey, S. de Bruin, M. Farina, L. Fatoyinbo, M.C. Hansen, M. Herold, R.A. Houghton, P.V. Potapov, D. Requena Suarez, R.M. Roman-Cuesta, S.S. Saatchi, C.M. Slay, S.A. Turubanova, A. Tyukavina. 2021. Global maps of twenty-first century forest carbon fluxes. Nature Climate Change. https://doi.org/10.1038/s41558-020-00976-6
Harris et al. (2021). Harris et al. (2021). Global maps of 21st century forest carbon fluxes. Accessed on 05/02/2022 from Global Forest Watch.

Map by Author



Map 20 - Net Forest Carbon Flux

DENSITETI I BIOMASEVE TE PEMEVE

3.7

TREE BIOMASS DENSITY

This map represents wall-to-wall aboveground biomass (AGB) at approximately 30-meter resolution. This data product expands on the methodology presented in Baccini et al. (2012) to generate a global map of aboveground live woody biomass density (megagrams biomass ha-1) at 0.00025-degree (approximately 30-meter) resolution for the year 2000. Aboveground biomass was estimated for more than seven hundred-thousand quality-filtered Geoscience Laser Altimeter System (GLAS) lidar observations using allometric equations that estimate AGB based on lidar-derived canopy metrics.

Source:
Woods Hole Research Center. Unpublished data. Accessed through Global Forest Watch Climate on 05/02/2022. climate.globalforestwatch.org

Map by Author

SOIL CARBON DENSITY

Additionally, accounting for the distribution of soil carbon under mangrove forests is necessary because mangrove forests are considered some of the most carbon-rich ecosystems in the world, with most of the carbon being stored in the soil. Measuring global SOC is essential to understanding carbon sequestration, agricultural productivity, and soil water levels, especially in areas impacted by a changing climate.

for >10% Tree Canopy
Vlorës has an aboveground live woody biomass density of 104t/ha, and a total aboveground biomass of 3.47Mt.

Map 21 - Tree Biomass Density

DENSITETI I KARBONIT TOKËS

3.8

SOIL CARBON DENSITY

This layer integrates two different data sets related to global soil organic carbon (SOC). One maps general SOC and the other maps SOC within mangrove forests. SOC is a major component of soil organic matter, which is derived from residual, decomposed plant and animal material. Natural factors (such as land cover, vegetation, topography, and climate) as well as human factors (such as land use and management) can influence the amount of soil organic matter, and thus soil organic carbon, present in soils.

Additionally, accounting for the distribution of soil carbon under mangrove forests is necessary because mangrove forests are considered some of the most carbon-rich ecosystems in the world, with most of the carbon being stored in the soil. Measuring global SOC is essential to understanding carbon sequestration, agricultural productivity, and soil water levels, especially in areas impacted by a changing climate.

Vlorës has a soil organic carbon density of 91.2tC/ha, and a total carbon storage of 14.5MtC.

Vlorës has a total carbon store of **16.6Mt**, with most of the carbon stored in **soil**.

Soil carbon
14.5Mt

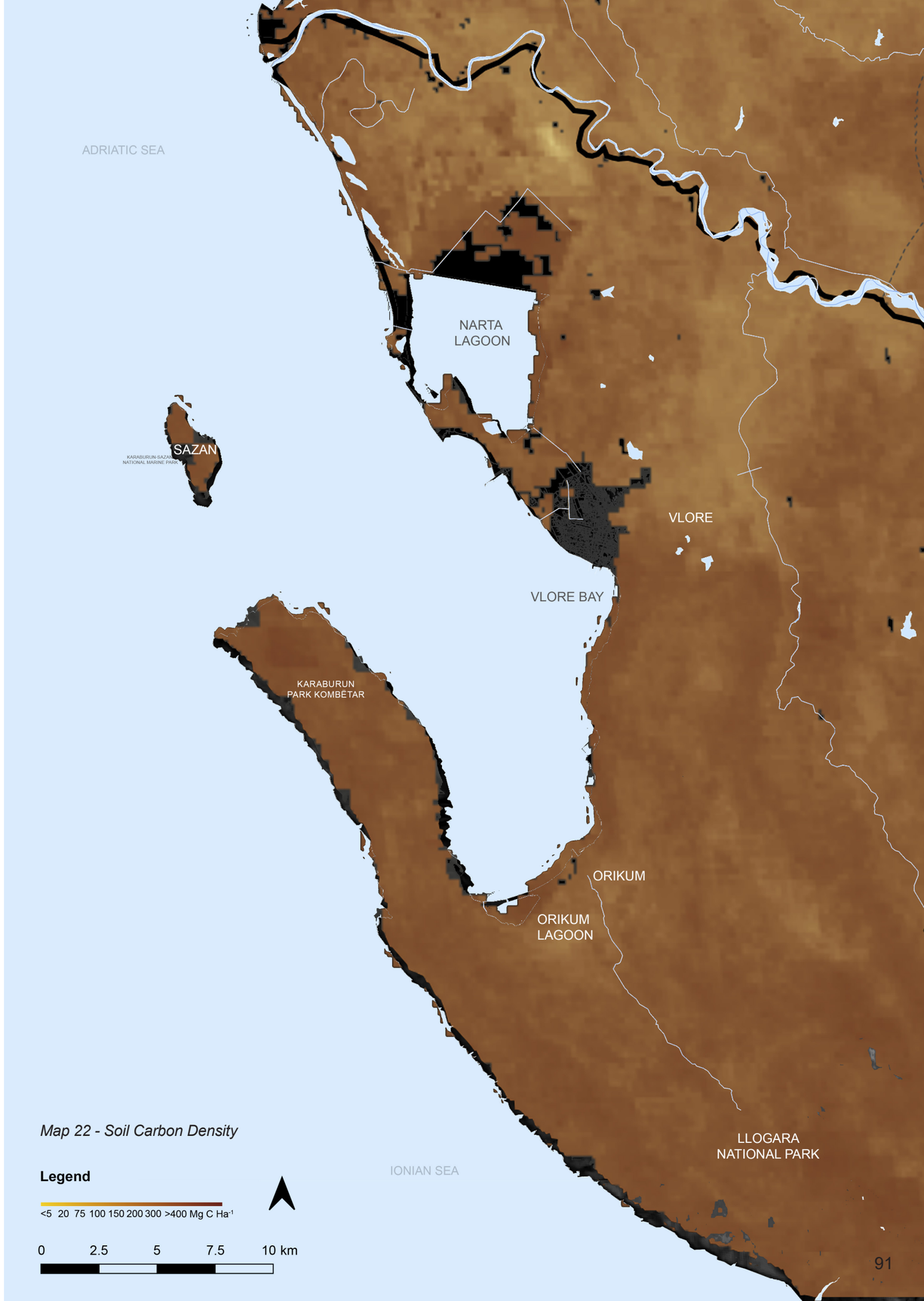
Above ground carbon
1.63Mt

Below ground carbon
424kt

>10% tree canopy

Sanderman J, Hengl T, Fiske G et al. (2018) A global map of mangrove forest soil carbon at 30 m spatial resolution. Environmental Research Letters 13: 055002. doi.org/10.1088/1748-9326/aabe1c
Mangroves: Sanderman J, Hengl T, Fiske G et al. (2018) A global map of mangrove forest soil carbon at 30 m spatial resolution. Environmental Research Letters 13: 055002. doi.org/10.1088/1748-9326/aabe1c
ISRIC: de Sousa, L. M., Poggio, L., Batjes, N. H., Heuvelink, G. B. M., Kempen, B., Riberio, E., and Rossiter, D.: SoilGrids 2.0: producing quality-assessed soil information for the globe, SOIL Discuss. [preprint], https://doi.org/10.5194/soil-2020-65, in review, 2020.
ISRIC Soil Grids

Map by Author



Map 22 - Soil Carbon Density

RËNDËSIA E BIODIVERSITETIT
3.9

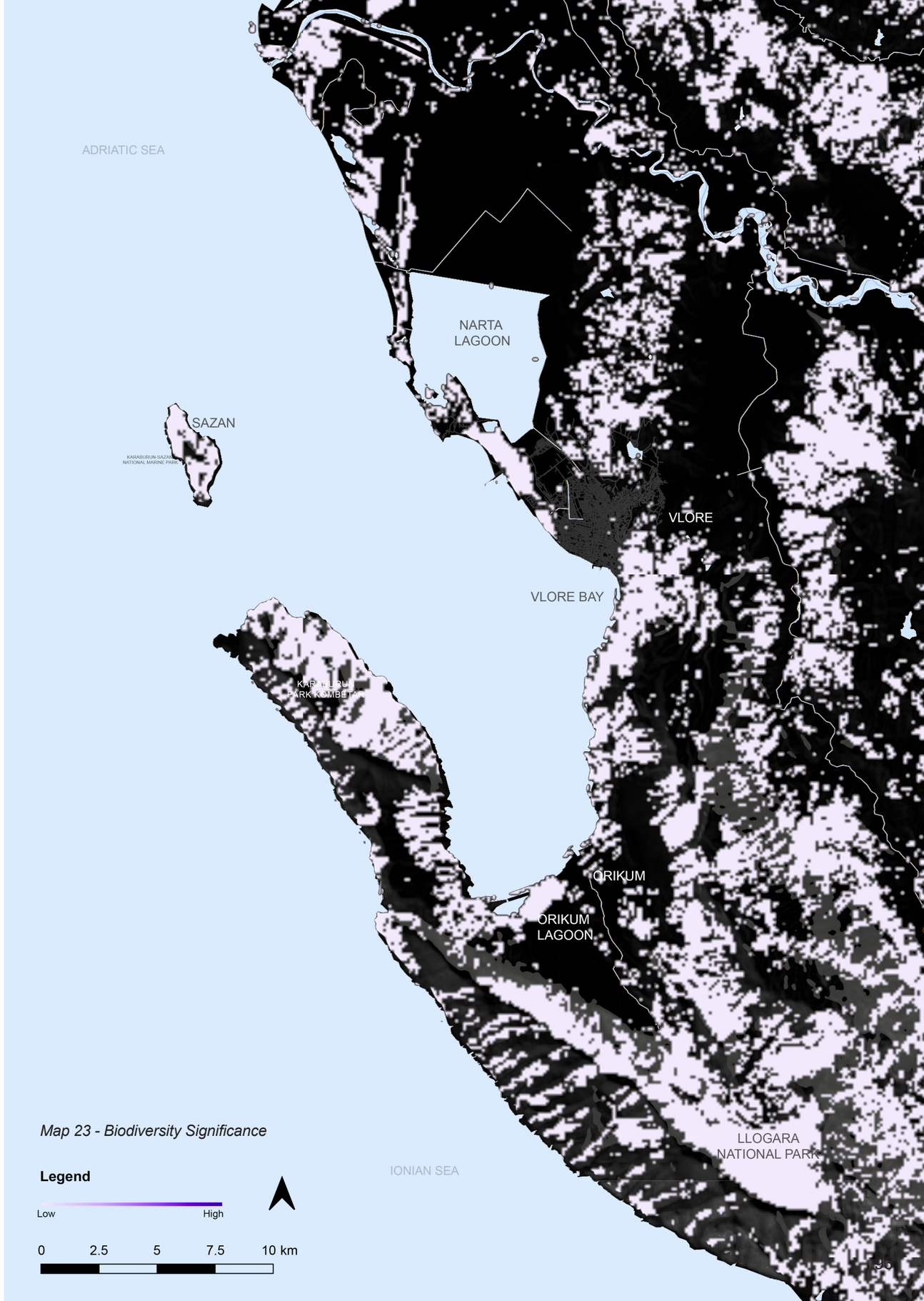
BIODIVERSITY SIGNIFICANCE

This layer shows the significance of each forest location for biodiversity in terms of the relative contribution of each pixel to the global distributions of all forest-dependent mammals, birds, amphibians and conifers worldwide. To calculate it, species that are coded in the IUCN Red List as forest dependent are selected and their distribution maps are clipped by their known altitudinal ranges (note amphibians' altitudinal range have not been assessed) using a digital elevation model (DEM) dataset, and overlapped with the layer of forest cover.

For each species, the relative "significance" of each forest pixel in their range is calculated as one divided by the total number of pixels of forest in their range. These values are summed for all species occurring within the pixel to give an overall value to the pixel. This metric is also sometimes termed 'range rarity'.

International Union for Conservation of Nature (IUCN), BirdLife International, and United Nations Environment World Conservation Monitoring Centre (UNEP-WCMC). The underlying species maps come from the IUCN Red List and BirdLife International. Integrated data from the IUCN Red List, World Database of Key Biodiversity Areas and World Database on Protected Areas are available in the Integrated Biodiversity Assessment Tool.

Map by Author



Map 23 - Biodiversity Significance

RËNDËSIA E BIODIVERSITETIT

3.9.1

BIODIVERSITY INTACTNESS

This layer quantifies the impact humans have had on the intactness of species communities. Anthropogenic pressures such as land use conversion have caused dramatic changes to the composition of species communities and this layer illustrates these changes by focusing on the impact of forest change on biodiversity intactness.

The maximum value indicates no human impact, while lower values indicate that intactness has been reduced. The PREDICTS database comprises over 3 million records of geographically and taxonomically representative data of land use impacts to local biodiversity (Hudson et al. 2017).

KEY BIODIVERSITY AREAS

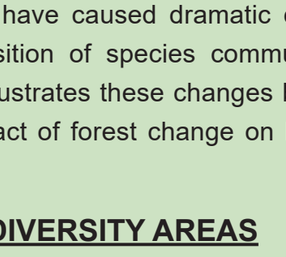
Full details of each KBA, including information on their biodiversity importance, can be viewed at http://www.keybiodiversityareas.org. The criteria by which KBAs are identified are described in the Global Standard for the Identification of Key Biodiversity Areas (IUCN 2016). Sites qualify as global KBAs if they meet one or more of 11 criteria, clustered into five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability. The KBA criteria can be applied to species and ecosystems in terrestrial, inland water and marine environments.

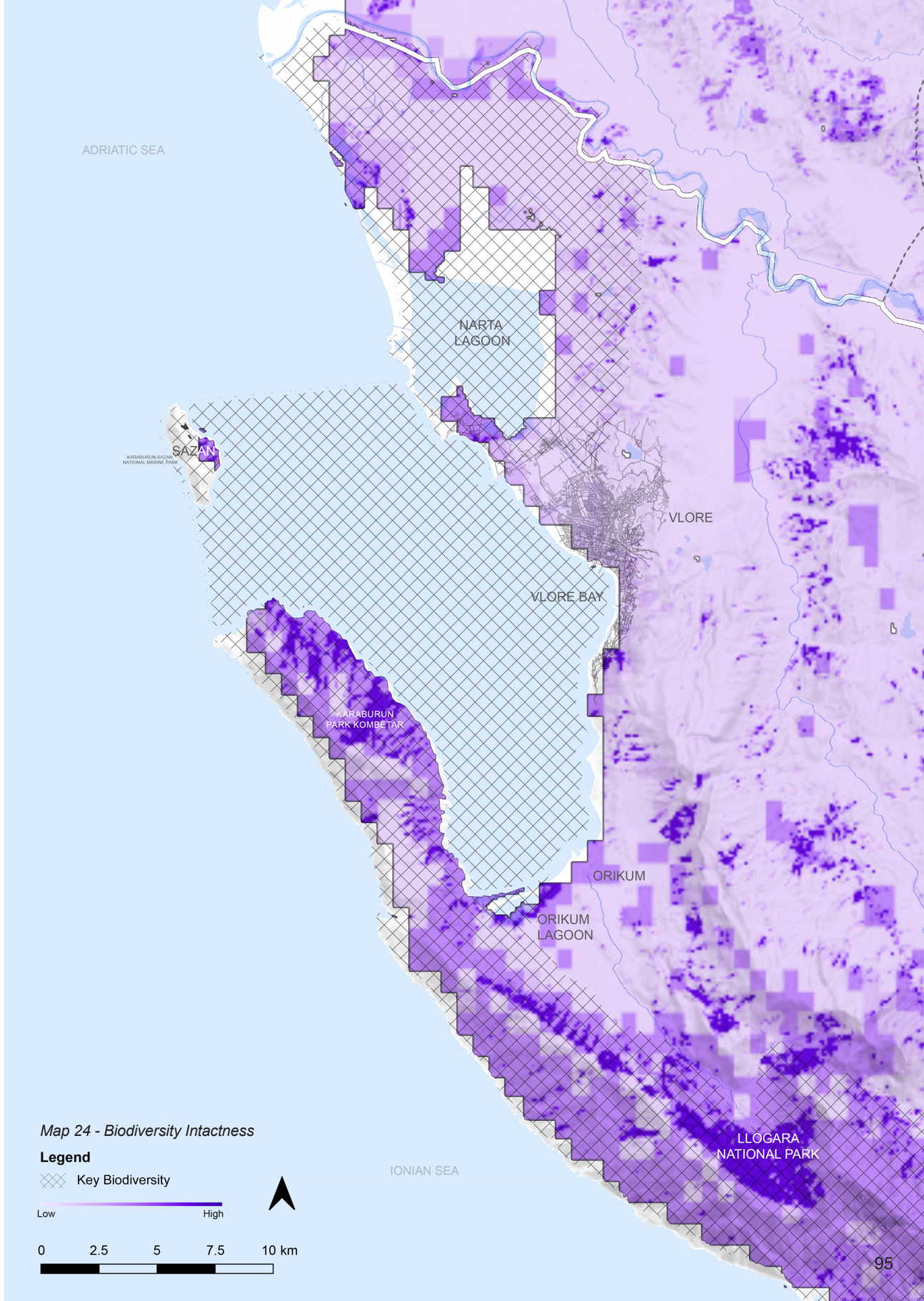
Although not all KBA criteria may be relevant to all elements of biodiversity, the thresholds associated with each of the criteria may be applied across all taxonomic groups (other than micro-organisms) and ecosystems. The KBA identification process is a highly inclusive, consultative and bottom-up exercise. Although anyone with appropriate scientific data may propose a site to qualify as a KBA, consultation with stakeholders at the national level (both non-governmental and governmental organizations) is required during the proposal process.

BirdLife International (2020). Digital boundaries of Key Biodiversity Areas from the World Database of Key Biodiversity Areas. Developed by the KBA Partnership: BirdLife International, International Union for the Conservation of Nature, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Global Wildlife Conservation, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, Wildlife Conservation Society and World Wildlife Fund. June 2021 Version. Available at http://keybiodiversityareas.org/kba-data/request.

UNEP-WCMC and Natural History Museum. "Biodiversity Intactness." Accessed from Global Forest Watch on 05/02/2022. www.globalforestwatch.org

Map by Author





Map 24 - Biodiversity Intactness

4. IMM

PARIMET E IMM

4.1

GENERAL PRINCIPLES OF IMM

Integrated Modification Methodology (IMM), an innovative design methodology, developed by the IMM Designlab is based on a specific process with the main goal of improving the Complex Adaptive Performance (CAS) and energy performance through the modification of its constituents and the optimization of the architecture of their ligands. Its approach is fundamentally holistic, multi-layered and scaled.

The methodology considers the city as a dynamic CAS comprised of the superimposition of an enormous number of interrelated components, categorized in different layers or subsystems, (themselves CAS) which through their inner arrangement and the architecture of their ligands provide a certain physical and provisional arrangement of the CAS.

The IMM investigates the relationships between urban morphology and energy consumption by focusing mostly on the subsystems characterized by physical characters and arrangements.

The main object of this design process is to address a more sustainable and better performing urban arrangement, aligned to the UN Sustainable Development Goals 2030 Accordingly, IMM focuses on the systemic arrangements of the built environment and proposes holistic procedures to transform urban systems into better performing entities, based on the unique qualities that each context offers.

(IMM Design Lab, Author)

The general scheme of the methodology's procedure applied in the research project is based on the iterative and nonlinear phasing process of IMM:

- Phase I. Investigation: Analysis & synthesis
- Phase II. Assessment and formulation
- Phase III. Intervention and modification
- Phase IV. Optimization

According to the system theory, there are four properties common to all types of systems:

- They are composed of elements.
- There is a relationship between elements.
- There is a certain function associated with any system (however, many systems including the built environment are multi-final systems, meaning that numerous functions are associated with them).

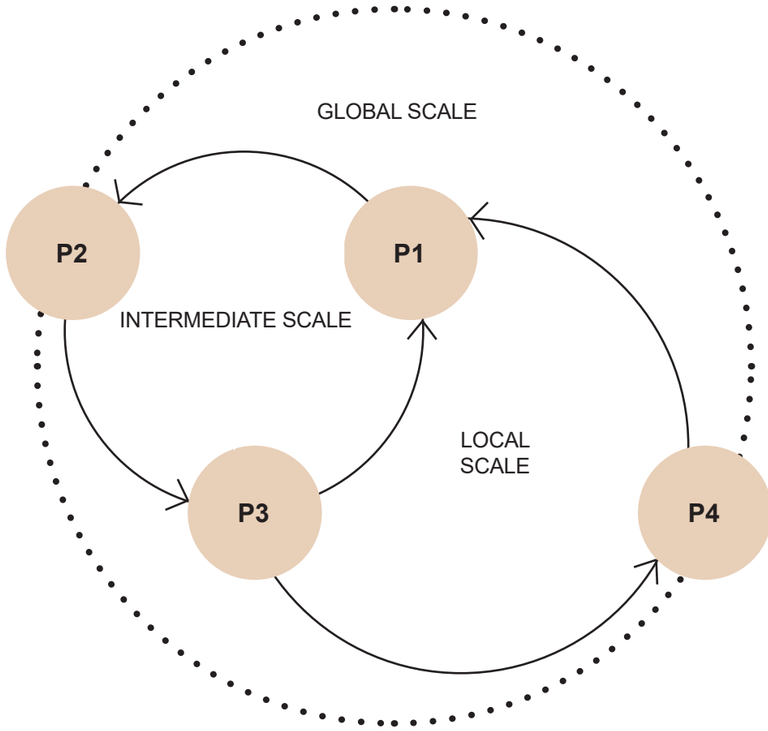


Figure 114 - IMM Phases

P1	Investigation/ Analysis	•Horizontal Investigation •Vertical Investigation •Performance Evaluation
P2	Formulation	•Horizontal Modification •Vertical Modification
P3	Modification/ Design	•Detection of Catalysts •DOP Arrangement
P4	Optimization/ Retrofitting	•Performance Assumption •Local Optimization

4.2 PHASE I

4.2.1. MODELING

As first phase, the IMM requires the division of the urban The Horizontal investigation starts by dismantling the physical components of the CAS into the four layers defined by IMM. Each subsystem is analyzed separately in order to observe their individual characteristics, aiming
to understand the urban configuration (Morphology), the socio-cultural space (Typology) and the incidence of human activity (Technology).

The IMM requires the division of the urban system into two-layer analysis:

1. The Horizontal analysis focuses on four physical characteristics of the urban texture: Volume, Voids, Function and Transportation

2. The Vertical analysis studies the relationships between the previous layers and defines seven categories: Porosity, Proximity, Diversity, Permeability, Interface, Accessibility and Effectiveness.

(IMM Design Lab & Author)

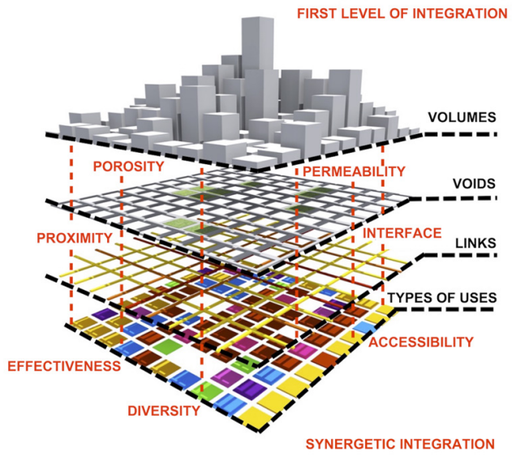


Figure 115 - Integration Levels

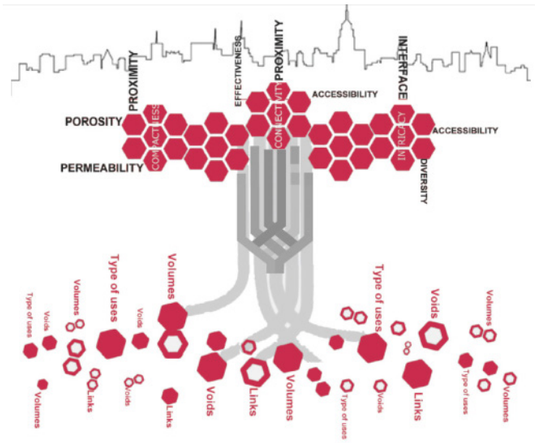


Figure 116 - Horizontal & vertical Investigation

4.2.2. HORIZONTAL ANALYSIS

IMM analyzes patterns of issues and malfunctioning circumstances in the urban setting as a complex adaptive system to determine the root of the problem. Diagnostic work is required for every effective transformation process since it identifies the source or type of malfunctioning conditions or problems via methodical examination. This stage entails a series of scientific investigations on the structure and features of the urban system.
Complex systems are known to be decomposable in their construction and to be organized at many levels with a strong mutual link between their subsets.

As a result, the diagnostic phase's goal is to disassemble the systems into their component pieces and investigate the subsystems, their attributes, and their relationships.

As a result, the system is being dismantled in the investigation phase. In terms of morphology, these elements for cities are:

- Urban Volume
- Urban Void
- Links
- Types of Uses

4.2.3. VERTICAL ANALYSIS

The vertical inquiry is made up of two horizontal layers superimposed on top of each other. The superimposition is necessary to generate results that support the site's performance. The research was carried out by paying close attention to the site's idiosyncrasies and adjusting the IMM as needed. The vertical analysis' purpose is to determine "Key Categories," which are morphological, typological, and technical characteristics of the city. These characteristics provide the designer with information about the existing state and performance of the urban surroundings in order to create a long-term urban design intervention.

The entire configuration of the CAS is the subject of a vertical examination. As a result, particular care must be taken when characterizing the relationships between the various subsystems (global configuration) in order to assign each one a defined job and set of features. The initial level of superimposition's major purpose is to figure out how the system's components (Volume, Voids, Functions, and Transportation) are connected.

As a result of superimposition, following maps are:

- Porosity
- Diversity
- Proximity
- Effectiveness
- Interface
- Permeability
- Accessibility

ANALIZA HORIZONTALE

4.2.2

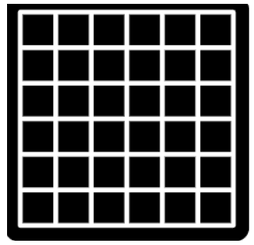
VOLUMES

To better comprehend Vlores layout and morphology, a volumetric analysis was performed.

The map showcases the presence of volumes or in essence buildings or structures located in the city, The city center has the highest volumetric density, and decreases as we move and sprawl outwards to the outskirts.

Larger volumes are predominantly centered along the Ismail Qemali Boulevard and the coastal strip characterized largely by the presence of residential and commercial buildings.

Description & Map by Author



Map 25 - Volumes

ANALIZA HORIZONTALE

4.2.2

VOIDS

The void analysis showcases open spaces spread through out the urban fabric of Vlore. A distinction between both designed and other open spaces was made. The voids as seen in the map imply a complex voids often disconnected with eachother. Some open designed spaces, such as parks, are, nonetheless, intentional added value spaces and can ne found in some parts of the city in addition to empty spaces acting as separators between city districts.

Description & Map by Author

Map 26 - Voids

ANALIZA HORIZONTALE

4.2.2

LINKS

The transportation infrastructure and services in the city of Vlore were studied and analyzed to develop the map showcasing links. The inhabitants primarily rely on private transpoprtation including cars and mopeds. The public transport network includes a bus service that is also a major mode of travel but was found to be lacking of a schedule. The public transportation network traverses on the Ismail Qemali boulevard and has some stops along the lower coastal strip. The interior districts of the city lack bus stops. The city also has an old railwayline that isnt functional but is sometimes used to transport freight, cargo and oil to the storage facility by the Soda forest.

The analysis reveals an imbalanced Vlore is missing on a balanced distributed links and has a main bus line with few stops and minimal biking lanes with a majority relying on private vehicles.

Description & Map by Author

Map 27 - Links

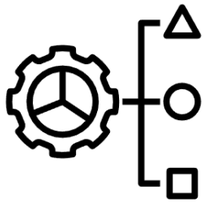
ANALIZA HORIZONTALE

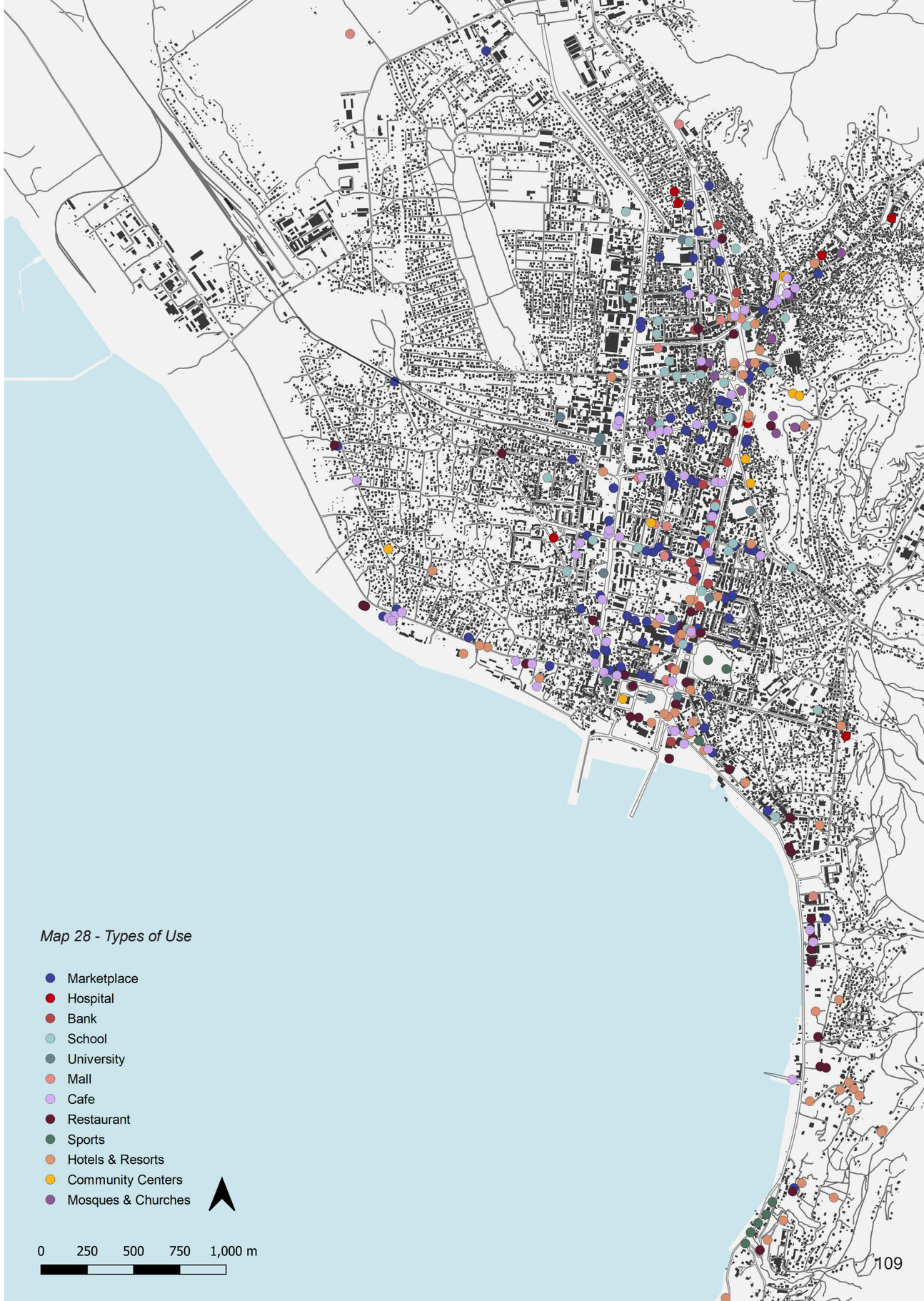
4.2.2

TYPES OF USE

The distribution of the functions in the city is directly relatable to the density of the volumes. As seen in this case study, functions are located on the main artery of Vlora, the Ismail Qimali boulevard. The interior districts lack access to key functions and require the inhabitants to travel considerable distance to the city center.

Description & Map by Author





Map 28 - Types of Use

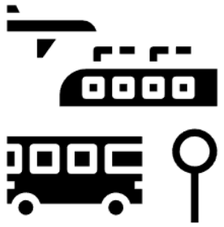
ANALIZA VERTIKALE

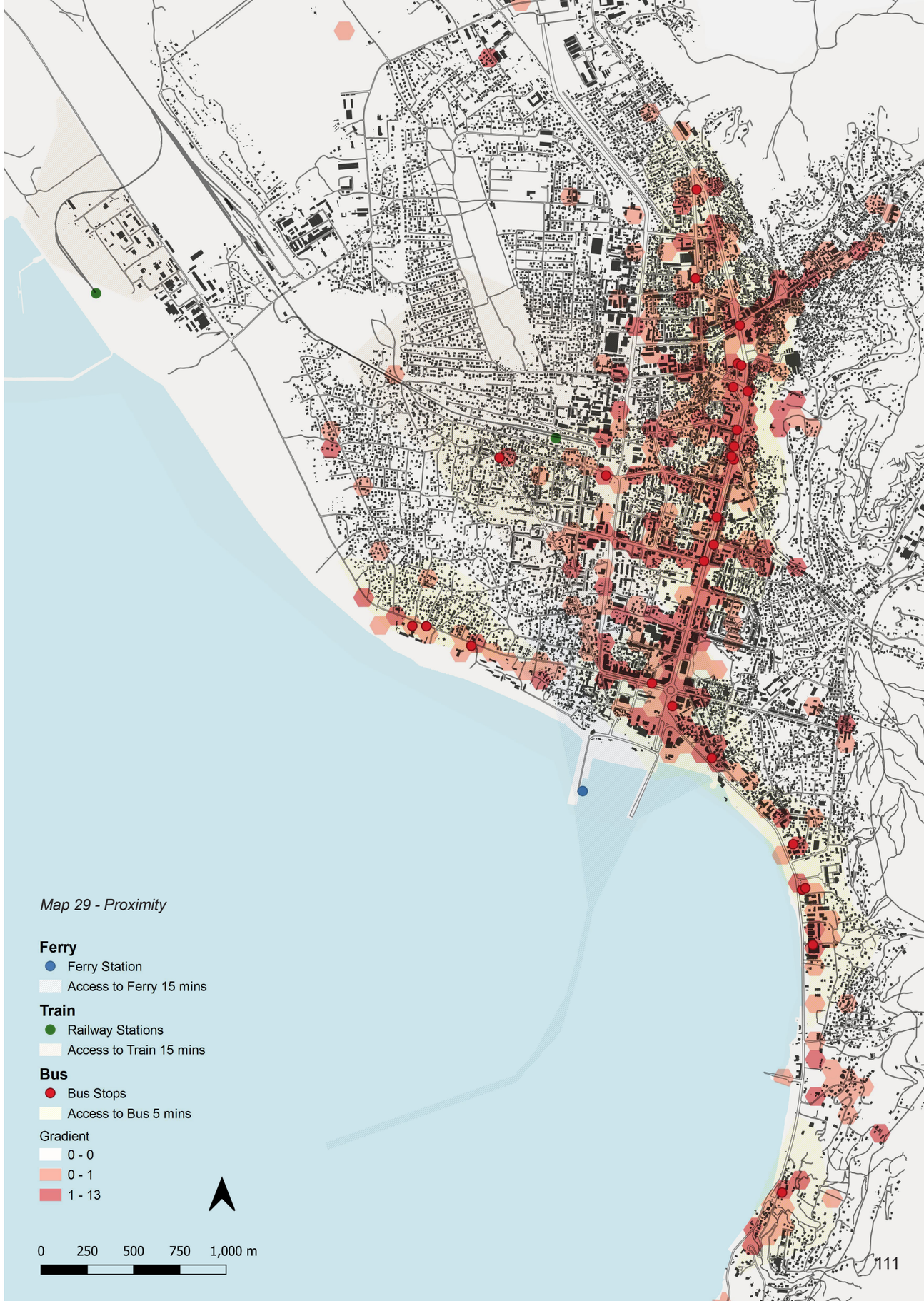
4.2.3

PROXIMITY

The access to transportation infrastructure is mainly centered along the main boulevard.

Description & Map by Author





ANALIZA VERTIKALE
4.2.3

DIVERSITY

Diversity is the superimposition of the voids and functions layers.

Diversity classifies the space between buildings into three categories:
1. Necessary regular activities,
2. Necessary occasional activities
3. Necessary optional activities.

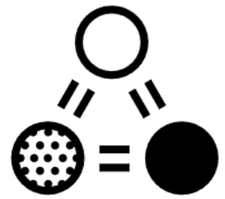
The association between functions and nearby Voids reveals the variety of functions available in each zone.

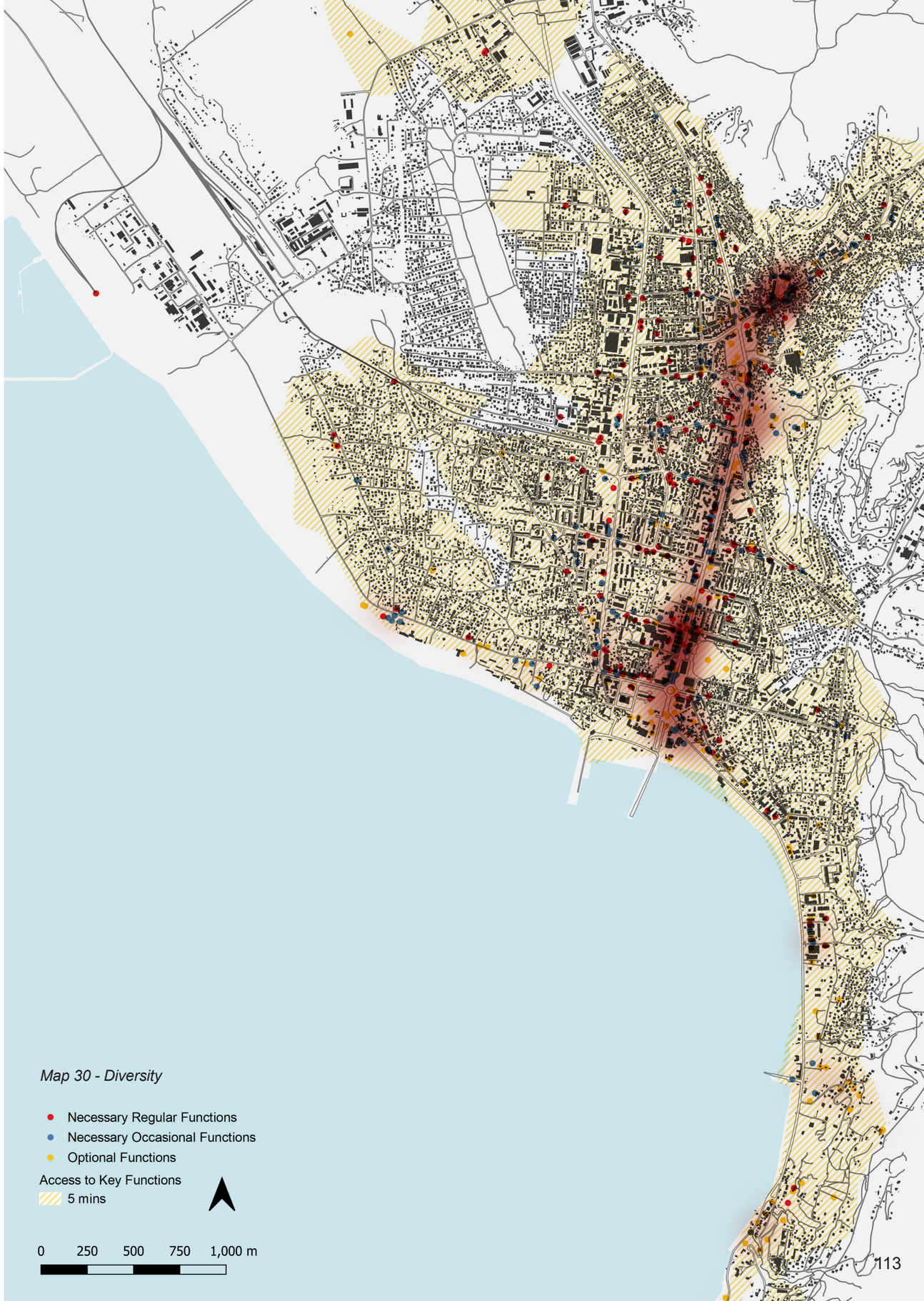
Regular activities that the community need on a regular basis, such as educational facilities, are considered necessary.

The necessary occasional actions are those that aren't required on a regular basis, such as governmental facilities.

Optional activities that are not required but are available for pleasure, such as cafés and restaurants, are referred to as necessary optional activities.

Description & Map by Author





Map 30 - Diversity

ANALIZA VERTIKALE

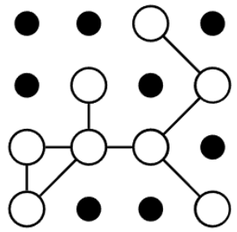
4.2.3

PERMEABILITY

Permeability is a term used in urban studies to describe how open or closed an urban shape is to people or vehicles moving in different directions. The capacity to travel across an area and the number of route options between any two sites were evaluated to characterize the permeability value of an urban fabric.

Main parameter investigated: street areas, link Length, directness, and constraints.

Description & Map by Author



Map 31 - Permeability

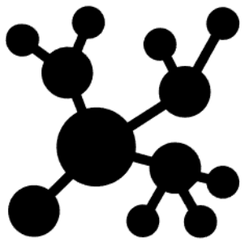
ANALIZA VERTIKALE

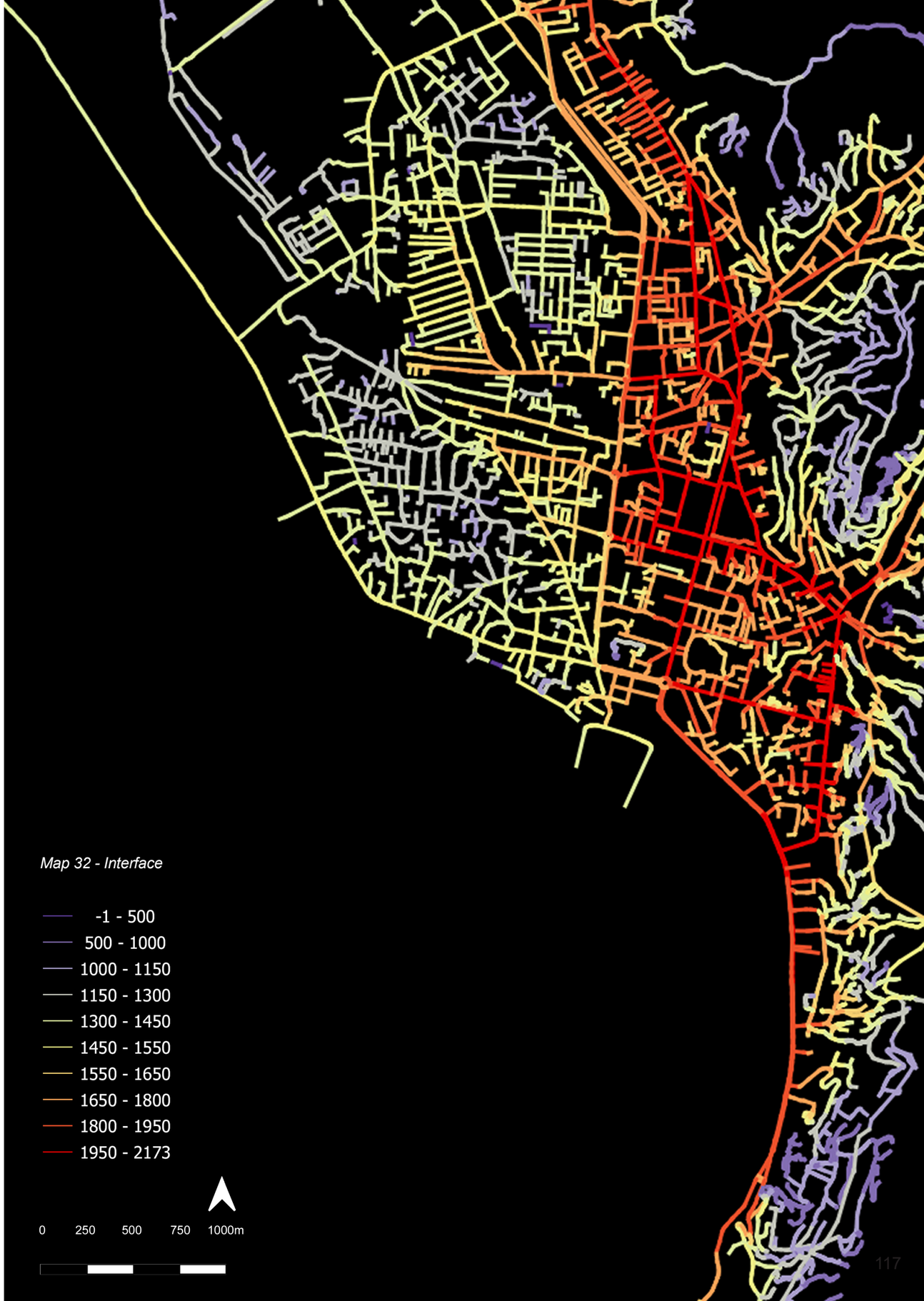
4.2.3

INTERFACE

The void and transportation layers are superimposed to get interface map. It is a measure of the roadway network's mobility quality as well as the efficiency of the urban morphology. The interface aids in recognizing the system's integration. The "UCL Depthmap" application was used to create the interface map. Warmer colors indicate a better interface zone in the results, which are displayed on a "heat scale."

Description & Map by Author





Map 32 - Interface

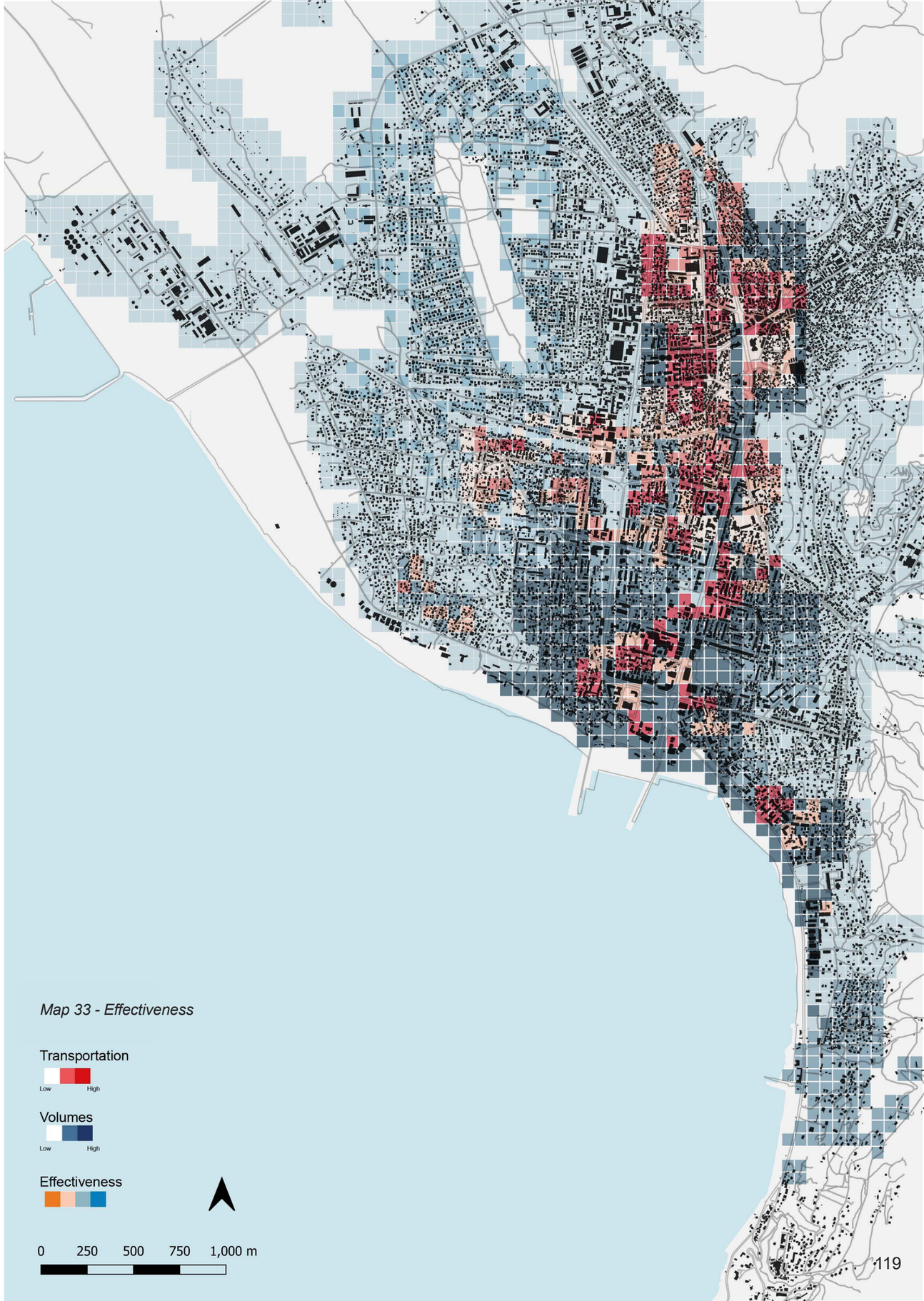
ANALIZA VERTIKALE

4.2.3

EFFECTIVENESS

The transportation and volume layers are superimposed to produce effectiveness layer. It specifies the capacity to provide the necessary outcome in terms of transportation to cover the built-up areas surrounding it. In addition, it specifies prospective development by designating an undeveloped region that is accessible by public transit as potential.

Description & Map by Author



Map 33 - Effectiveness

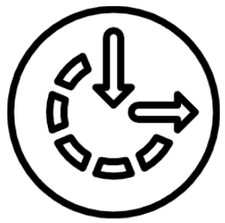
ANALIZA VERTIKALE

4.2.3

ACCESSIBILITY

Accessibility is the study of the urban fabric to determine the link between public transit and volumes. It reveals which places are easily accessible via various modes of transportation such as bus, train, bike, ferry, and cargo.

Description & Map by Author



Map 34 - Accessibility

ANALIZA VERTIKALE
4.2.3

POROSITY

The amount of the urban built-up and its connection to urban voids are the determining factors in all definitions used to assess urban porosity. The most obvious form-related quality that identifies and differentiates the spatial qualities is the volume/void arrangement. As a result, this research examines the relationship between the constructed and unbuilt spaces, as well as the building heights. As a result, the maps depict the volume voids and density of volumes in the fabric. The maps show that the core section of Vlore is dense, but development is relatively modest in the outside parts and along the shore, despite the large volume dispersion.

Description & Map by Author

Map 35 - Porosity

TABELA E TREGUESVE 4.2.4

4.2.4. TABLE OF INDICATORS

The IMM list of indicators is an open excel document created by IMMDesignLab that contains over 100 indicators grouped according to IMM theory. It's more than just a collection of individual indications that make up a list.

The 135 indicators are organized in a spreadsheet file with filters to make understanding and analyzing easier. Each indicator has its own set of features that characterize the data and allow for simple comparison.

Each indication, in particular, has three basic characteristics:

- The DOP (Design Ordering Principles) family, which is linked to the Integrated Modification Methodology

- A key category in the examination of the Vertical Investigation

- Compactness, Complexity, Connectivity, Governance, and Management are the decisive macrofamilies impacting the CAS's success at the second level of integration. Some indicators are governed by formulae that connect several types of data to provide ratios or percentages that are more useful for comparing the actual CAS to the future designed CAS.

Table9 - Table of Indicators (Author)

Indicators	*Actual CAS Performance Output*	*Actual CAS performance Input*		
1. Ground Use:				
a) Urban Built density. Building Volume Density (BVD)	**7.748**	Total volume of building s 26435619	Total area 3411710	
b)11.3.1 Ratio of land consumption rate to population growth rate	**-129.00**	County plan -129		
c) Number of buildings per hectare	**22.896**	Number of building 27475	Total area (in ha) 1200	
d) Number of inhabitants per hectare	**156.396**	Number of inhabitants 187675	Total area (in ha) 1200	
f) land cover change in a given area %	**10.318**	Current land use (in mq) 1031771.4	Initial land use (in mq) 100000	Total area (in mq) 12000000
g) Albedo surface fraction	**0.2**	% 0.2		
h) Solar energy potential of a given area	**4.1**	KWh/m2 4.1		
i) Block Density	**0.552**	Number of blocks in a given area 662	Total area (in ha) 1200	
m) Land cover in a given area	**0.97**	Land covered in ha 1161.8	Total area (in ha) 1200	
3. Multiplicity and Variety:				
a) Ratio between numbers of residents and activities*	**8530.68**	Total residents 187675	Total number of activites 22	
b) Housing diversity* (%)	**0.11**	Low income housing 3050	Total housing 27474	
d) Ratio of place dedicated to Innovation and Knowledge* (%)	**2.5**	Number of IK activities 56	Total activities 22	
4. Urban biodiversity:				
d) Number of native Plants	**900**	N. 900		
e) Number of native birds	**323**	N. 323		
f) Number of native butterflies	**173**	N. 173		
g) Number of native species	**150**	N. 150		
h) How prevalent are invasive alien species	**196**	N. 196		
l) Number of different natural ecosystem found in the city	**6**	N. 6		
5. Green Spaces:				
a) a) Lawn Cover Ratio (LCR)	**2939.96**	Total grass surface 34324	Total open surface area 1167.5	
b) Extent and number of parks (%)	**0.0025**	Numbers of parks 3	Total area (in ha) 1200	
c) Percentage of trees in the city in relation to city area	**6.37**	Number of trees 207	City area (in Ha) 32.5	
d) Land Surface Albedo (LSA)	**0.2**	% 0.2		
e) Tree Cover Ratio (TCR):	**86.977**	area covered by trees 1043.72	Total area (in ha) 1200	
6a. Cyclabilty:				
a) Length of biking roads (km)	**0.000024**	Km 4.447	Total residents 187675	
c) Number of bike parking spots	**0.000005**	Number of parking spots 1	Total residents 187675	
d) Bike Sharing	**1.000000**	Number 1	per capita 1	
6b. Walkability:				
d) Pedestrian street paths (%)	**0.22**	Total pedestrian street 88974	Total street 407998	
f) Number of Crosswalks	**92**	Number of Crosswalk 92		
7a. Urban flow (people)				
l) Total number of journeys by public transport	**17.6**	% 17.6		
n) Average length of a public transport trip	**1.38**	Km 1.38		
7b. Urban flow and mobility (Immaterial flow)				
a) Internet access	**72.000000**	% 72		
9. Energy management:				
b) Rate of energy coming from renewable sources* (%)	**0.468777**	Total renewable en. prod 16.29	Total en. prod (MToe) 34.75	
c) Renewable energy percentage in transport (%)	**0.00000021**	Total renewable energy in transp. 6.5	Total energy in transportation 31654000	
12. Water mangement*4:				
d) Total Annual Water Consumption	**39000**	Cubic meter 39000	per capita	
e) Produced urban wastewaters	**6000**	Cubic meter 6000		
i) Reused wastewater	**15.38**	% 15.38		
n) Wastewater purified in a wastewater treatment plant*	**6000**	Cubic meter 6000		

FAZA II
4.3

4.3 PHASE II

4.3.1 PROBLEM STATEMENT

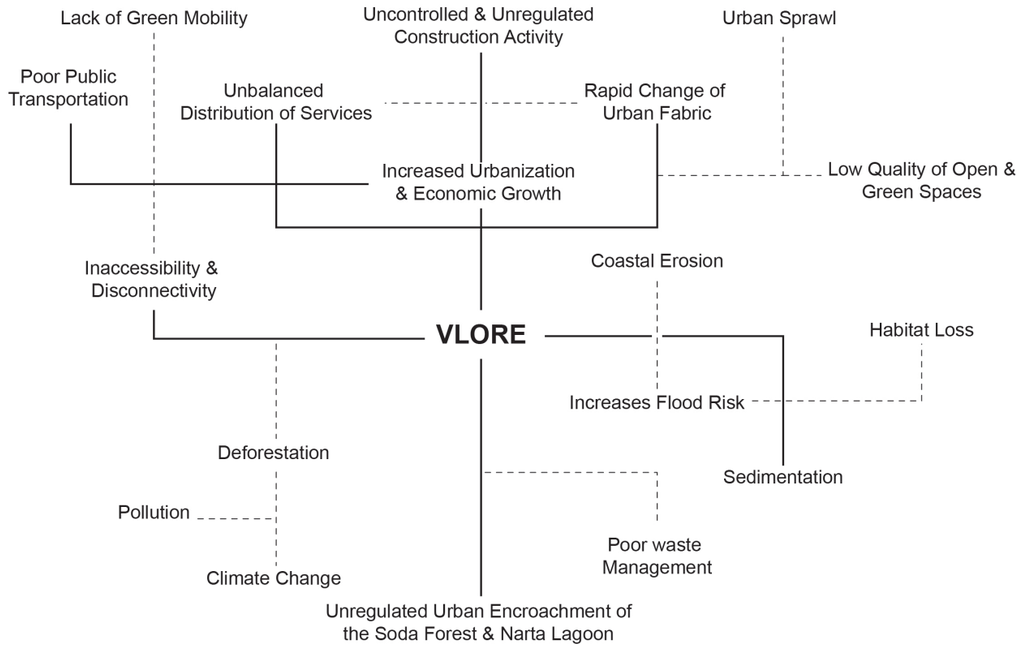
The urban fabric of the city of Vlore, Albania is changing at a rapid pace, with new development that rises to meet requirements of its community. The acceleration of urbanization & development has enormous potential for sustainable economic growth & improving the urban metabolism that caters to and for the community. The investment into infrastructure, tourism & social initiatives by collaboration of international stakeholders provides vital opportunities for promoting a circular economy. However, a multitude of issues recognized would need to be mitigated to ensure an integrated urban & ecological fabric.

The increased urbanization and economic growth of Vlore has added to the existing unbalanced distribution of services. The uncontrolled & unregulated construction activity has led to an urban sprawl that impacts the quality of open & green spaces impacting accessibility & connectivity. Green mobility dedicated infrastructure for walkability & biking is lacking and disconnected. The unbalanced integration of accessibility & connectivity of public transportation contributes towards the communities increased reliance on private transportation.

Author

The pollution, deforestation & unregulated urban encroachment of the Soda Forest & Narta Lagoon disregards the natural & cultural sites of interest. Factors contributing to climate change are increasing due to unsustainable management & trade-offs. The poor waste management, landfills & discharge of sewage has severely contaminated soil & groundwater adversely impacting the endemic biodiversity also affecting the health & wellbeing of the community. The construction of the proposed Kalivaç Hydropower Plant in the Vjosa river increases flood risk, sedimentation, coastal erosion with subsequent habitat loss.

The combination and interaction of the issues recognized are barriers to the efficient growth & transformation of Vlore into balanced urban metabolism that integrates the complex ecosystems to pursue a decarbonised & resilient regeneration.



4.3.2. IMM CATALYZERS RANKING

HORIZONTAL	VERTICAL
1 VOIDS	1 INTERFACE
2 LINKS	2 DIVERSITY
3 TYPES OF USE / VOLUMES	3 PROXIMITY
	4 PERMEABILITY
	5 POROSITY
	6 ACCESSIBILITY
	7 EFFECTIVENESS

KATALIZATOR HORIZONTAL

4.3.2

HORIZONTAL CATALYZER

Morphologically speaking, these parts for the cities would be Urban Volume, Urban Void, Links, and Types of Uses.

The two areas selected show in the **voids** map a lack of courtyards or designed open spaces. The sprawl in the urban fabric with the lack of urban planning seen in the **volumes** map.

Analyzing the **types of use**, the Boulevard Ismail Qemali is the main artery of Vlore where most of the functions are located and the rest are spreading out around it resulting in malfuction of the western part of Vlore.

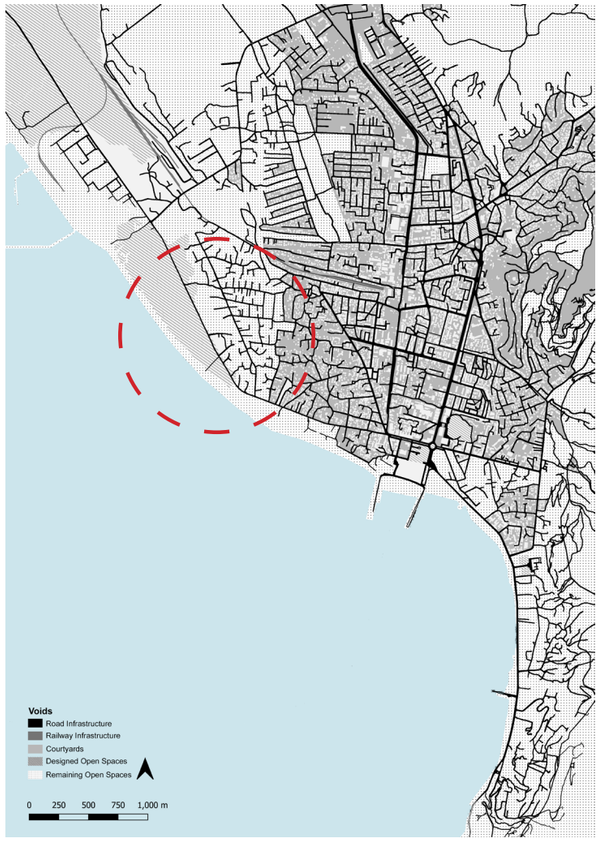
A disconnection in the Vlore city parts is found where the **links** are located to connect mainly the Boulevard Ismail Qemali and the coastal line in the southern part. Residential areas are neglected and residents rely primarly on their own private transportation mode as cars, bicycles, and footwalk.

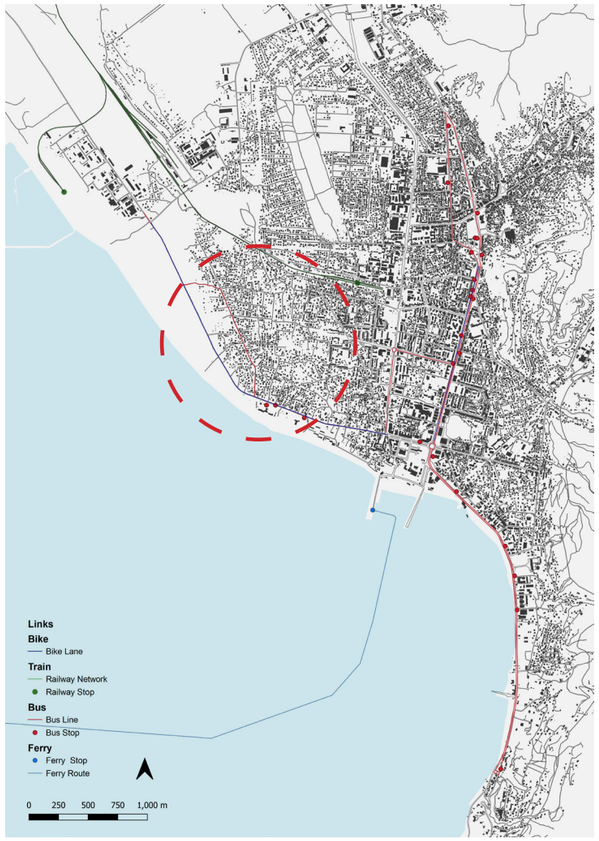
After analyzing the subsystems, an underdevelopment and malfunction of the western part is recognized and resulting in two main weak areas.

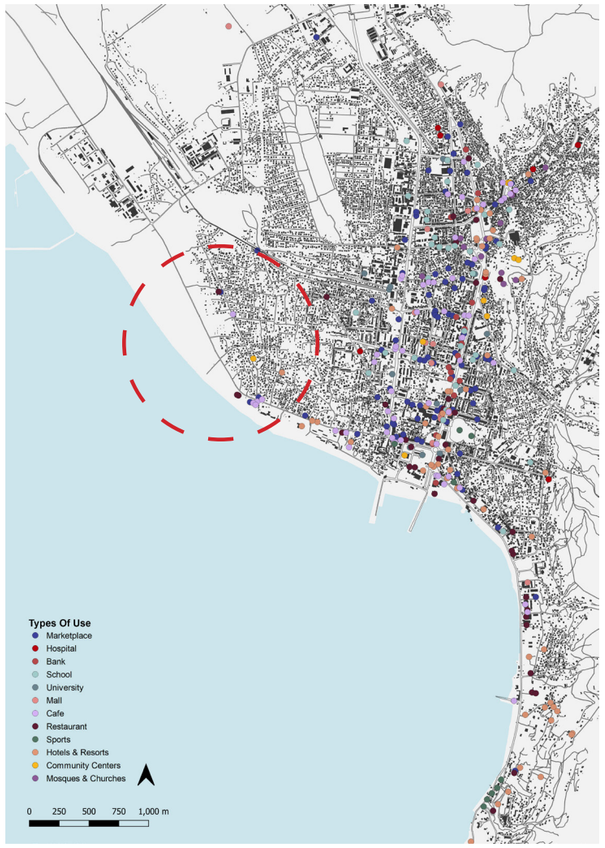
Enhancing these areas has potential transformation to boost the connection of the western part with the heart of the city and linking them which will result in better distribution of functions instead of having functional pockets.

SELECTED HORIZONTAL CATALYZER

VOIDS







KATALIZATOR VERTIKALE

4.3.2

4.3.2. VERTICAL CATALYZER

The IMM Key Categories are: Porosity, Permeability, Proximity, Diversity, Interface, Accessibility, and Effectiveness.

The two areas selected show in the **interface** map blue cold areas that has poor connection with the city center part which is highly connected and active. This resulted in a **low permeability**, minimum street connections and moderate urban flow hence modest quality of **voids**.

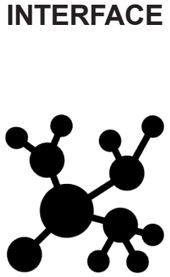
Functions distributed in a local area disconnecting city parts, hence a low **diversity**.

After analyzing the subsystems, an underdevelopment of the western part is recognized and resulting in two main weak areas.

Enhancing these areas has potential transformation to boost the connection of the western part with the heart of the city and linking them which will result in better distribution of functions instead of having functional pockets.

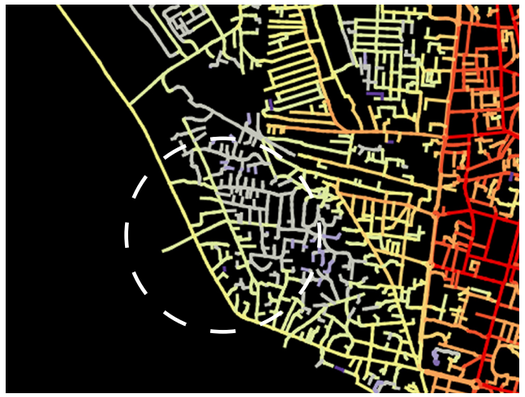
SELECTED VERTICAL CATALYZER

INTERFACE

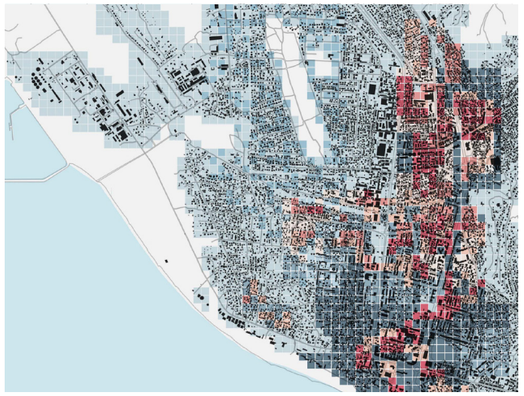


Map 36 - Porosity

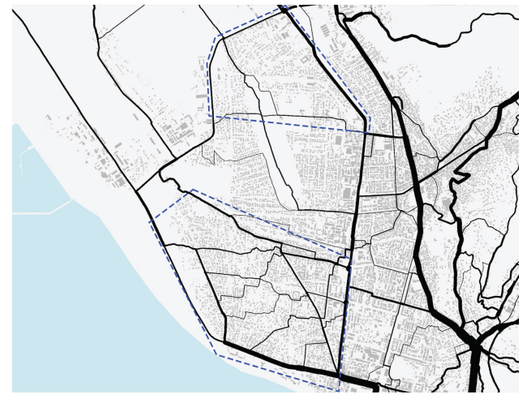
Map 37 - Proximity



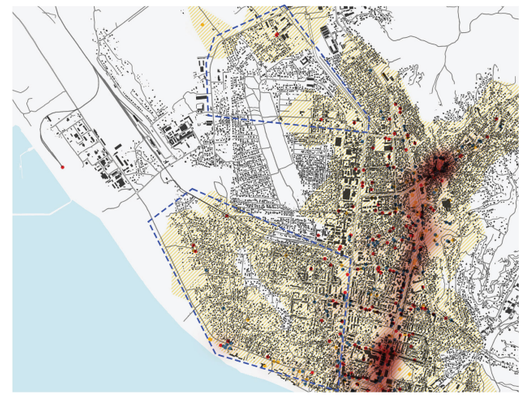
Map 38 - Interface



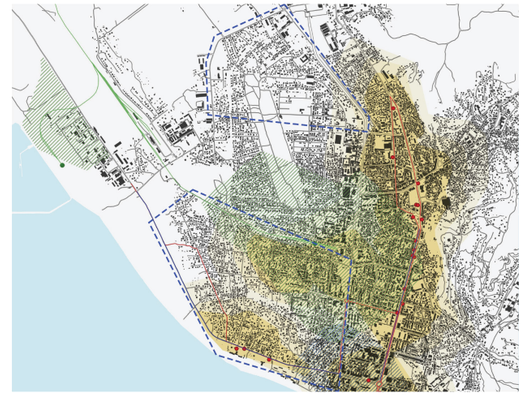
Map 39 - Effectiveness



Map 40 - Permeability



Map 41 - Diversity



Map 42 - Accessibility

RENDITJA DOP

4.3.3

DESIGN ORDERING PRINCIPLES

In IMM, Design Ordering Principles (DOP) are descriptive guidelines to orient designers toward an awareness of systemic principles in the more complex problem areas being faced by design teams. It's important to highlight that this set of tools includes a variety of complex interactions and relationships between DOP. Therefore, rather than being a list of universal commandments, they address the issue locally; and by their local oriented arrangement, they lay the foundation of transformation.

DOP are not a linear list of recommendations but a net framework of integrated actions, so we cannot aim to achieve just one goal. We must achieve them all: this is called Integration. In IMM, D O P are used to be arranged in consideration of the specific conditions of the CAS and specifically organized to deal with the weakness of the system and in particular to modify the malfunctioning of individual components of the actual CAS, responsible of its own actual performance.

This Integration of action makes IMM working with a systemic approach and producing systemic reactions by a net framework of integrated action.

CATALYZERS RANKING

The selected DOP's are ranked according to the selected catalyzers as follow:

5	GREEN SPACE
4	BIODIVERSITY
3	BALANCE DISTRIBUTION OF FUNCTIONS
6	WALKABILITY & CYCLING
2	PERMEABILITY
1	GROUND USE BALANCE
8	MULTIMODALITY TO INTER-MODALITY
7	BALANCING PUBLIC TRANSPORTATION
9	ENERGY

Table10 - Catalyzers Ranking

	DESIGN ORDERING PRINCIPLES	KEY CATEGORIES	DETERMINANTS
MORPHOLOGY	Balance the ground use.	Porosity	Compactness
	Implement permeability to facilitate urban flows and adopt a locally based strategy for fostering the permeability. (Filtered; Unfiltered; Managed… Permeability)	Permeability	
TYPOLOGY	Balance the distribution of functions and developing multifunctional urban spaces.	Diversity	Complexity
	Make Biodiversity an important part of urban life.	Diversity	
	Create connected open spaces system, activate urban metabolism.	Interface	
TECHNOLOGY	Promote Walkability, Cycling and reinforce their integration with public transportation.	Proximity	Governance
	Balancing the public transportation potential.	Effectiveness	
	Change from multimodality to inter-modality concept.	Accessibility	
TECHNOLOGY	Fostering the local energy production; Building as Components of Community Energy System. (Smart Grid)	Governance	
	Convert the City in a food producer. Prevent the negative impact of waste.		
	Implement water management.		

Table11 - DOP List

The list of the DOP (Ordering Design Principles) in IMM. Source: IMMdesignlab. Ordering the DOPs in consideration of the local condition and the elected Catalyst is part of the IMM transformation Phase and it allows focusing design on most urgent issues weighting the impact of benefits from transformation.

OBJEKTIVAT E ZHVILLIMIT TË QËNDRUESHËM

4.3.4

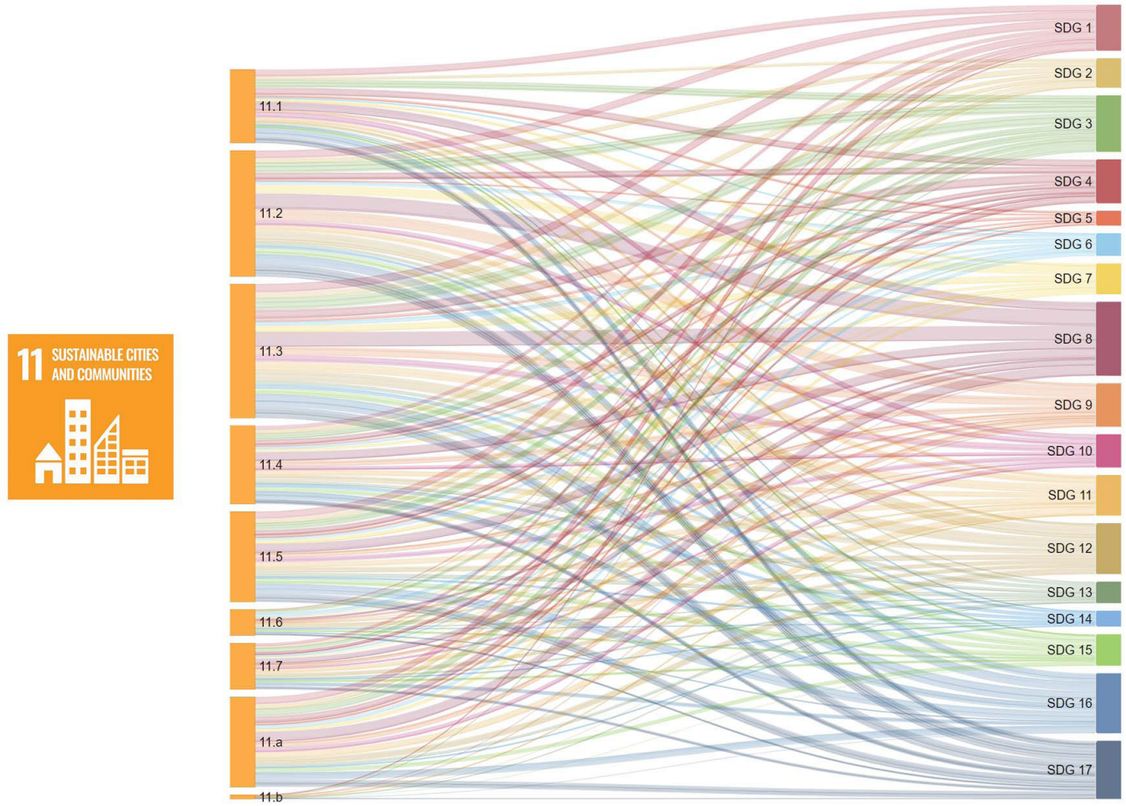
SUSTAINABLE DEVELOPMENT GOALS

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

THE SELECTED SDG IS SDG #11:

SUSTAINABLE CITIES AND COMMUNITIES



Through a Sustainable Development Cooperation Framework with the Government of Albania, the UN fully supports and works towards the complementary agendas of Albania's Goal of accession to the European Union (EU), national priorities, as well as harmonization and aid effectiveness. This includes Albania's commitment to achieving the SDGs.

5. STRATEGIC SYSTEMS

HARTA STRATEGJIKE

5.1

STRATEGIC MAP

The intensive analysis with IMM and selection of catalyzers coupled with the application of SDG's and relevant DOP'S led to strategizing for the malfunctioning and weak areas of Vlore by interventions and recommendations for improving the city.

Ecosystems serve as protective buffers against natural hazards in Vlore. They increase the resilience of the community by strengthening livelihoods and the availability and quality of drinking water, food supplies and other natural resources. Through the process of regulated urban expansion, Vlore can transform through its rich and diverse ecosystems as a strategy for reducing risk and contributing to resilience and sustainability.

The suggestion of reclaimation through afforestation and waste management systems in Vlore, Soda forest & Zvernec would greatly help in a decarbonized urban regeneration. Waste collection and planting sites were identified that could improve the quality of the city. A public space for the broader community was also subsequently designed by us in the Soda forest sanctioned by the Vlore Municipality.

The transportation infrastructure of Vlore is also a prioritized intervention as it would significantly enhance the efficient flow of the city's internal space to a large extent, which would stimulate the vitality of urban development promoting integration of diverse elements effectively improving the risk response ability of the overall urban infrastructure, thereby improving self-stability and adaptability of the urban system boosting its resilience.

Green urban mobility, the extension of bike track from the waterfront to the forest and city, bike sharing and addition of bus stops at lacking points are strategized. A green bus line from the strategic Soda forest to the touristic island of Zvernec is also envisioned to reduce and improve the quality of access. The lack of a bus station leading to irregular scattering of pick and drop points & confused commuters and the construction of the new Vlore International Airport, unfortunately in the protected landscape of Narte lagoon adds additional stress and touristic traffic which would need to be mitigated & managed.

Hence, an intermodal hub at the junction of the forest, city and primary highway connecting airport & other cities was strategized and developed in the later sections of this dissertation.

The concept of resilience continues to evolve with additional disciplines and stakeholders adopting and adding to the concept, thereby adding complexity to defining a truly resilient strategy for Vlore. The broader context of it pertaining to Albania as a whole and it to be an EU member.

The definitions of resilience also now include qualities that imbue it with more than simply withstanding a shock or recovering function but incorporate the complexity of new equilibriums, reducing vulnerability and social and mental wellbeing of the community that seeks to thrive beyond established thresholds.

Identifying factors for resilience and their respective measures must also be supplemented by understanding how these various factors interact with one another thereby integrating the community of Vlore.The integration of which strongly depends from the outcomes of the strategic planning and analysis processes conducted, involvement & support by the Vlore Municipality and shall work as the tangible expression of the shared broader development of Vlore by positively impacting community on scales such as poverty and demographic changes, educational success and employment. The transformation of neighbourhoods and the communities fight against social exclusion, isolation and discrimination being part of the same equation as well.

The challenge is, therefore, to start up and develop a set of integrated projects, involving homogeneous zones of interventions based on their morphological, socio-economic and/or cultural features which in turn leads towards the final parts of this dissertation involving the design of a resilience hub for the city of Vlore that would enable them to do and achieve the same.

Author

Map by Author

Map 43 - Strategy Map

REKOMANDIME STRATEGJIKE

5.2

The table here recommends in brief depth about specific interventions and proposals based on the proposed strategy, study and analysis of Vlore, stakeholders and a resilient vision for the city.

Author

FOR A VLORE THAT IS :

REFLECTIVE

RESOURCEFUL

ROBUST

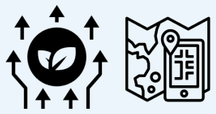
REDUNDANT

FLEXIBLE

INCLUSIVE

INTEGRATED

Table12 - Recommendations Table (Author)

CATEGORY	STRATEGIC RECOMMENDATIONS
TRANSPORT NETWORK 	1. An organized public bus transport network with schedule & new bus stops for better accessibility. 2. An intermodal hub to better manage existing local & touristic traffic in, to & from Vlore. 3. Established connection at strategic points from the proposed Vlore International Airport. 4. Relocation of unorganized inter city shuttle minibus services to suggested intermodal hub. 5. Extension of existing dedicated bike path to Soda forest with potential till Zvernec and the monastery. 6. Management and promotion of green urban mobility, bike sharing points etc.
URBAN INFRASTRUCTURE 	Infrastructure, such as water supply networks, sanitation and sewage systems, power supply networks etc, are either lacking or inadequate in Vlora as we move away from the city center and waterfront. 1. Education and training regarding key sectors for regional development. 2. Preservation of water springs and water cycle management. 3. Promotion of renewable energy and energy saving. 4. Incentives to switch to Greener systems and technology. 5. Coastal resilience through artificial interventions to protect natural coastline & beaches from erosion. 6. Regulation and management of uncontrolled urban sprawl & encroachment into protected areas.
WATER & WASTE MANAGEMENT 	1. Environmentally sustainable water treatment near the Soda Forest for the city of Vlore. 2. Rehabilitation of drainage and irrigation network as they were lacking upon the visit to Vlore. 3. Protection of the territory from hydrogeological risk as investigated in the Resilience Map analysis. 4. Decontamination Soda forest, the landfill adjacent & organized solid waste management & recycling. 5. Provision of dustbins at strategic and identified locations in neighbourhoods and public spaces.
SUSTAINABLE TOURISM 	1. A Visitor Center for Vlore effective territorial communication and marketing of Vlore & surroundings. 2. Qualification and diversification of accommodation structures of EU baseline standards. 3. Valorisation and integration of cultural identities and landscape and environment. 4. Improving infrastructure and services for tourism. 5. Conservation of Narta & Orikum Lagoon, Llogara and Sazan Karabarun ecosystems conservation. 6. Education and training regarding key sectors for regional development by the Vlore Municipality. 7. Knowledge, preservation, restoration and qualification of historical assets. 8. Improvement of value chains with cultural production & heritage of Vlore & Zvernec. 9. Enhancement of the transport networks to improve territorial accessibility and competitiveness. 10. Building of public restrooms in the main tourist areas.
SOCIAL COHESIVENESS 	1.Improving and innovating social care services offered in Vlore. 2.Strengthening social integration of women and minorities through community awareness and equity. 3.Improving environmental sustainability and urban quality in towns and villages 4.Integration of Roma minority, support for employment & education by the Vlore Municipality, 5.Monitoring & eradication of corruption in organizations that hinder development. 6.Awareness, education collaboration of diverse groupst to benefit from growth of local community.
HEALTH & WELL BEING 	1. Develop public spaces within urban proximity at the waterfront and Soda forest. 2. Afsorestation measures at identified and potential reclaimation sites. 3. Improving public health care services & their accessibility. 4. Awareness & advocation for mental health. 5. Provision of maintained natural and built spaces with access to excercise equipment
GREEN ECONOMY 	Agriculture has an important role in the maintenance of traditional rural landscape, and rural activities, if not developed in a sustainable way, can have a negative impact on the environment, polluting water and soil with wastes and pesticides and reducing biodiversity with inadequate culture selection. 1. Incentivize and support enterprises credit accessibility for farmers, breeders and craftsmen. 2. Promotion of typical products and increase of quality products for export purpose like wine & olives.
BLUE ECONOMY 	Fishing and aquaculture are typical activities in Vlora Region, and have a background of know-how, crafts and traditional products, that is strongly interconnected with the regional community culture. Therefore, enhancing regional cultural heritage, helps to increase the regional attractiveness and to recover and reinforce the regional community sense of identity and belonging. 1. Renovation of land ports and development of moorings integrated services. 2. Enhancement of the transport networks to improve territorial accessibility and competitiveness. 3. Improving environmental sustainability and urban quality in towns and villages. 4. Reinforcing Natural coastline

6. Internship

Stakeholders involed in:

VLORE GREEN – A municipality-owned company model for environmental services and the rehabilitation and conservation of natural areas of the Municipality of Vlore

OVERALL OBJECTIVE FOR INTERNSHIP:

The Italian-Albanian Development Cooperation Programme includes a new instrument of financing innovative for Albania: the Debt for Development Swap Agreement (IADSA), which is meant to support the implementation of projects in the social sector proposed by the concerned Albanian Public Institutions and jointly agreed within the framework of the Italian-Albanian Development Cooperation Programme.

This thesis is developed in the frame of the “Vlorë-Milano City-to-City Cooperation” between the Municipality of Milan and the Municipality of Vlorë, to support the sustainable development of the Municipality of Vlorë.

The thesis will contribute to increase the local awareness on sustainable local development in order to safeguard of natural and cultural heritage, promoting circular economy, social enterprises, social impact investment.

The sustainable local development of the Municipality of Vlorë is a core issue raising by town’s growth acceleration occurred in the last years in terms of urbanization, population, economy and human activities impact on the natural sites belonging to the Gulf of Vlorë. Municipal public services need to be supported, integrated and empowered accordingly. The final aim of the thesis is to develop a pilot project and community-focused projects to drive decarbonised and resilient urban regeneration.

TARGETS ACHIEVED:

Identification and implementation of measures for the recovery of polluted sites in the Soda Forest and the Narta Lagoon;

Conversion of 6 polluted sites into environmental conservation hubs.

Strategies to drive decarbonised urban resilient regeneration of Vlore through IMM analysis.

Supporting the sustainable development of the Municipality of Vlore by proposing an architectural and urban solution to meet desired objectives.

The project activities involved working with the NGO Celim to meet a part of the project objectives. The author (925394) supported the NGO in Vlore and coauthor (942212) remotely from Milan. The potential sites were recognized, investigated and visited in order to realise a well supported intervention in the subsequent chapters.

The conclusion of the internship was followed by an official meeting between the thesis supervisors, delegates from the municipalities of Milan & Vlore ,Celim and the author in a participatory capacity in Vlore, Albania on 18th March, 2022.

The proposals 3 of 6 are in due process of being built sanctioned by the Municipality of Vlore led by Celims Vlore office as of 24th May, 2022.

HETIMI I VENDIT

6.2

HAZARDOUS CONSTRAINTS

The investigation and study of the Soda forest for potential intervention sites showcased through the map and corresponding pictures and description upon visiting the area.

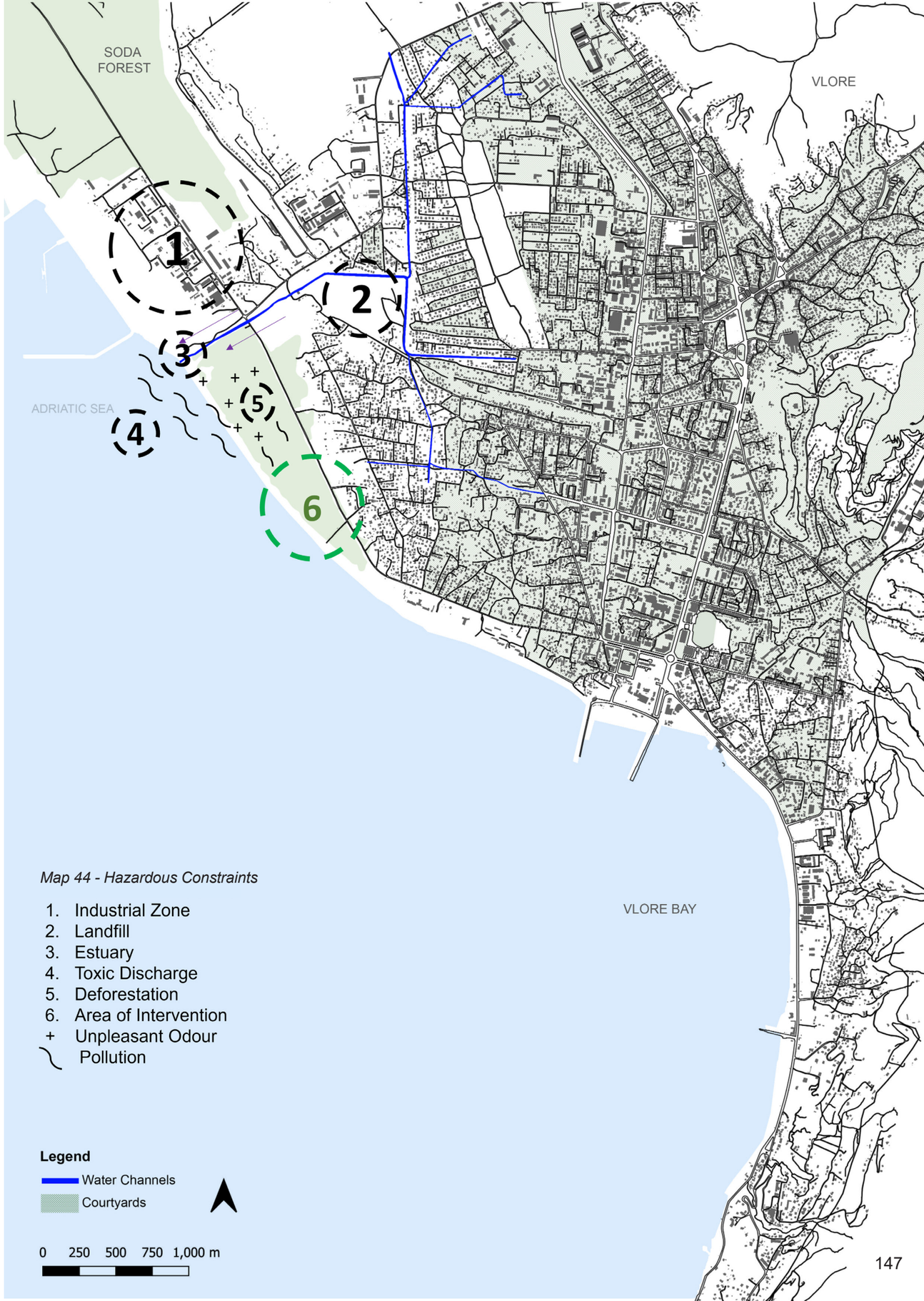
Figure 117 - La Petrolifera Italo Albanese Sh.A. (PIA) operates a coastal terminal for LPG, Oil, its by products and additional liquid and dry products in the Bay of Vlora. Its proximity to the sea, forest and city makes it a major pollutant and increased toxicity levels by the environmental report by Arpa Lombardia. The indusrial zone located by the encroached forest poses a major potential risk and health hazard to the marine life and inhabitants of the city of Vlore. Proposing a project thus in the lower reach of the Soda forest is also a way to ensure that encroachment is reduced and protective measures taken.Photo by G&A Projekt.

Figure 118 - The landfill lies adjacent to the protected Soda forest and in close proximity to the sea and dangerouslu close to the city and its residents as well. The toxic discharges from the untreated waste leaches into the soil and increases toxicity levels endangering the natural water table and the health of the community. The air around the area is foul smelling and toxic making it difficult for pedestrians and travellers to pass by and is recognized as a major threat and risk. The landfill however is to be moved as a new one is under construction located towards the outskirts of the city of Vlore but its still a long way to go and it could be many years before the transfer is realized. Photo by Author

Figure 119 - The estuary landfill toxic discharge flowing into the sea. The Sazan island in the background. Photo by Author.

Figure 120 - 116 - The water channels from the city circumventing the landfill with toxic discharge flowing into the estuary into the Vlore Gulf. Photo by Author.

Figure 121 - Volunteers cleaning up a site of dumping in the Soda forest. Evidence of deforestation in the foreground. Courtesy Celim.



Map 44 - Hazardous Constraints

1. Industrial Zone
2. Landfill
3. Estuary
4. Toxic Discharge
5. Deforestation
6. Area of Intervention

\+ Unpleasant Odour

Pollution

VIZIONI
6.3

THE VISION

Proposing a nature based design along the existing strip of Vlore at locations A & B in the Soda forest would allow for an extension of the city into the forest in a responsible manner thereby connecting the largely neglected urban areas and the urban city center and boulevard.

Figure 122 - **A** *The estuary landfill toxic discharge flowing into the sea. The Sazan island in the background. (Author)*

Figure 123 - **B** *Sand dunes, pine trees & beach by the football field in the Soda forest. (Author)*

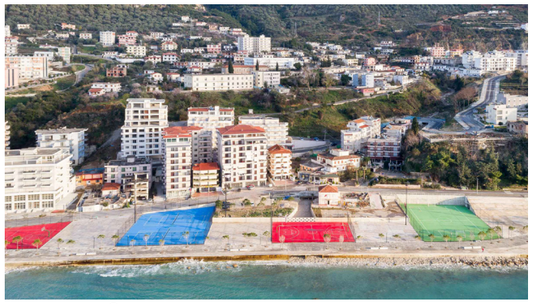


Figure 124 - **C** *Aerial view of the sports fields at the end of the seafront promenade. © Matthias Van Rossen*

Figure 125 - **D** *New park by the sea. (Author).*

Figure 126 - **E** *The steps as a meeting place or space for contemplating the water. (Author)*

Figure 127 - **F** *Aerial view of the park with its reticular geometry of white paths.*

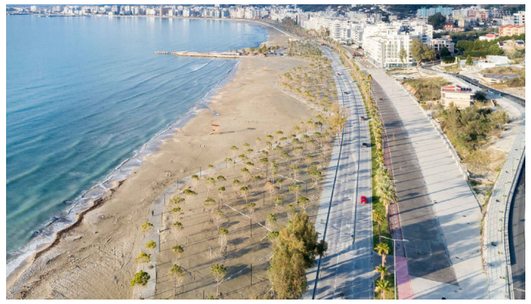
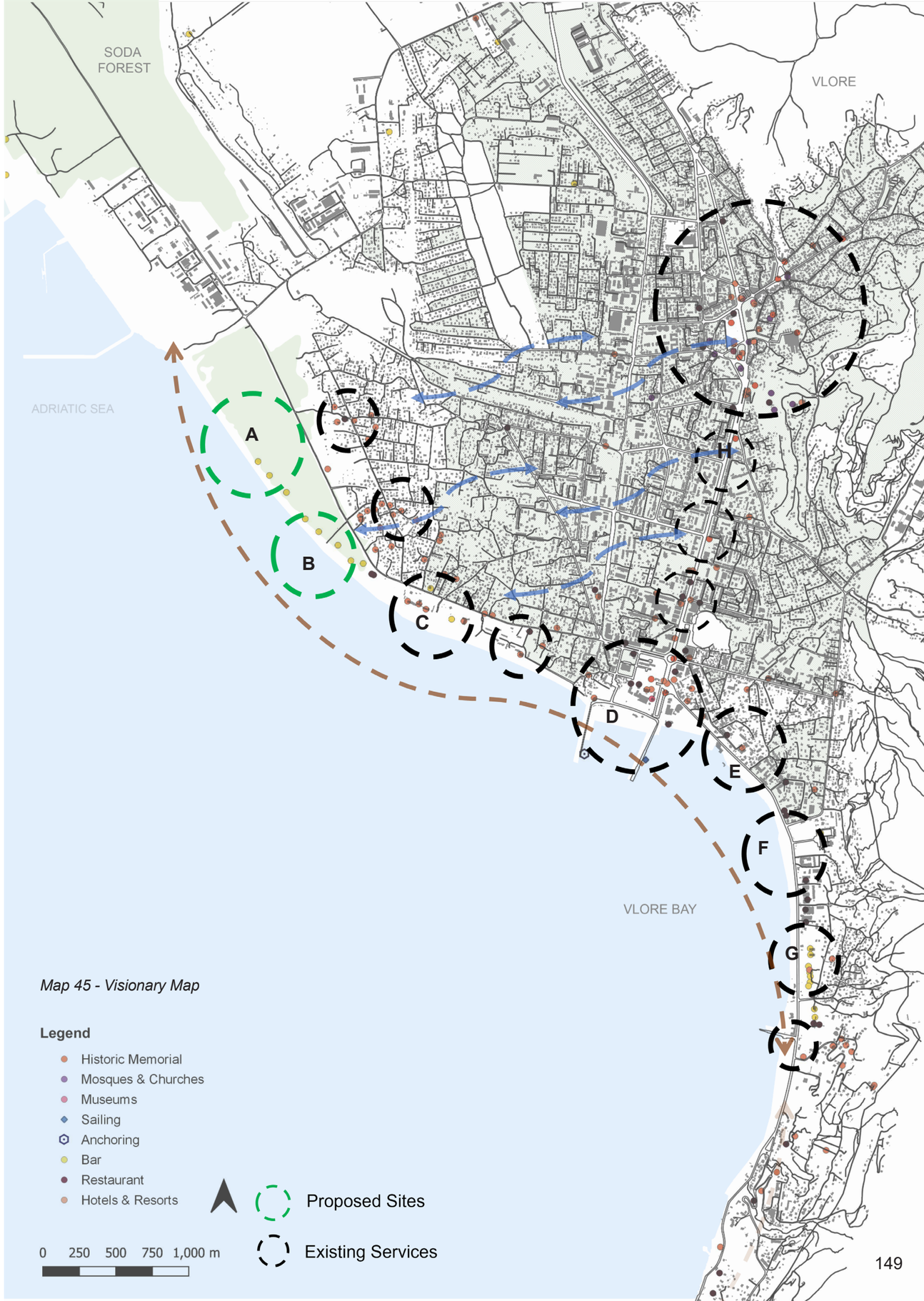


Figure 128 - **G** *The promenade, now taking a sinuous form, delimits pine plantations extending onto the beach.*



Map 45 - Visionary Map

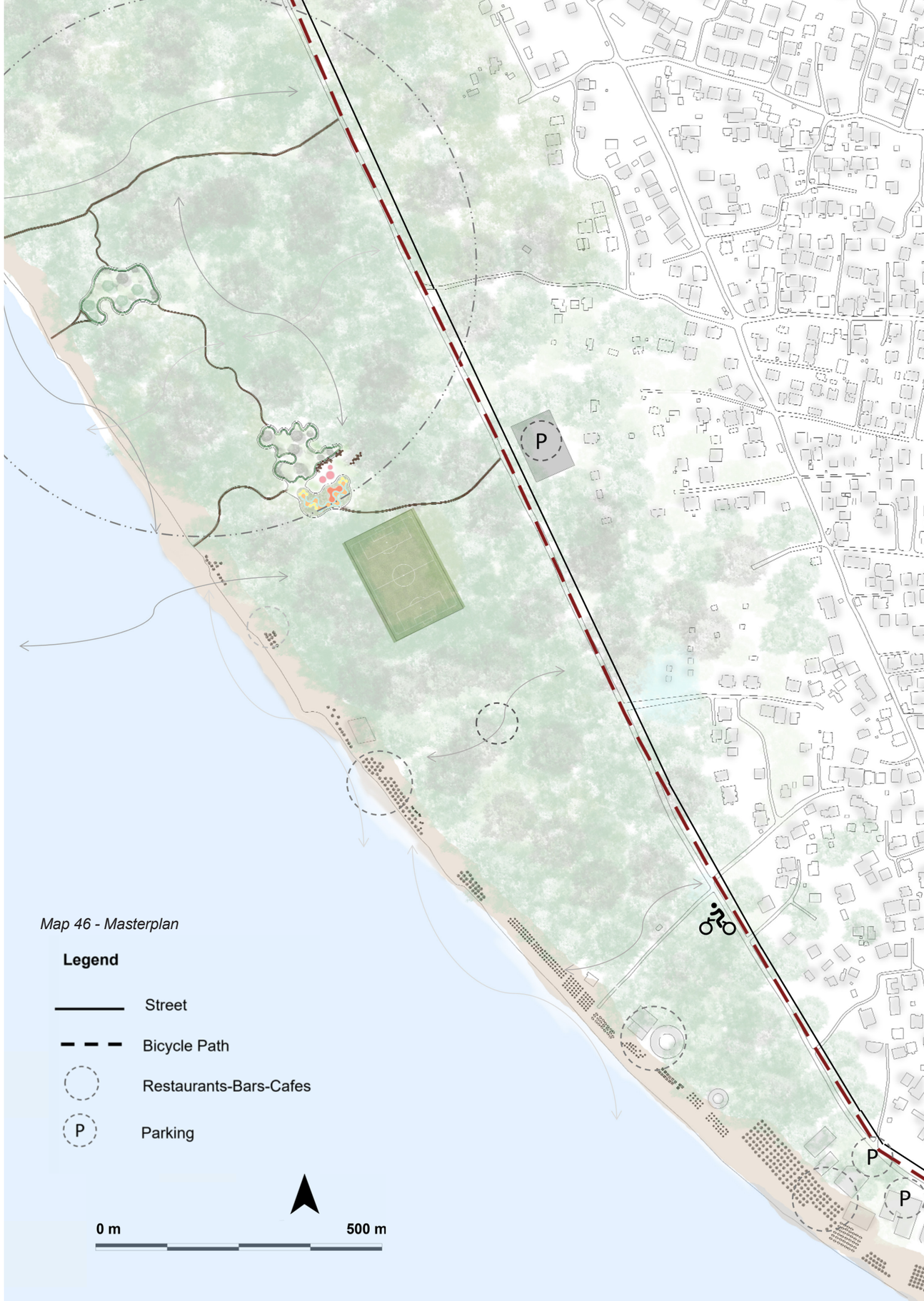
PLANI KRYESOR 6.4

MASTERPLAN

The first site chosen for three hubs is located by the football field in the Soda Forest and includes the proposal for a recreational space, a children's playground with outdoor adult gym equipment, and an enclosed walkway with a protected wetland that has endemic biodiversity connected to another enclosure nearby also improving the existing paths through the forest and reinforcing the commercial functions on the beach. Such an intervention also makes sense owing to the proximity to the existing bicycle path, the parking at the entrance of the football field and a well-lit area.

The proposed design tried to maximise the existing and proposed interventions by various stakeholders to ensure that the limited budget would not restrict the serviceability of the design. For example, the proposed design routes of access to the potential areas in the Soda Forest involves the identified paths and forest fire barriers identified by Parco di Campo di Fieri. The investment by them and the groundwork laid by them adds to the projects proposed by the design. Also, the design kept in mind the broader strategy of the inclusivity of the urban analysis that was done intensively. The proposal works and aims to mitigate the disconnect between the two parts of the city of Vlore thereby ensuring a sustainable urban intervention and transformation that would add benefits and incentives for potential investments in the coming years

Author



Map 46 - Masterplan

ZONA E QENDRËSISË

6.5

TERRAIN TEXTURES

SIGHT

SOUND

FRAGRANCE

TOUCH

HEALTH

WELL BEING

SOCIAL INTERACTION

PROTECTED ZONE
FOR ALBANIAN FROGS

SOCIAL INTERACTION

WASTE MANAGEMENT

THE HUB

The zone is intended to provide respite from the urban & industrial fabric surrounding it. The space responds to growing demands for a hub and constructs space for visitors to feel alone with nature. The curvaceous foot path circumvents a marshy space home to endemic and endangered species of the Albanian frog. It is also connected to a similarly designed space that leads to the beach with a path traversinbg through the woods.The site additionally provides spaces for open-air activities, outdoor excercising equipment and a playground for children that will enrich urban life.

The Soda forest has been disregarded by the community ofVlore owing to it being an illegal dumpsite and tarnished by layers of waste but has found itself to be part of a major cleaning drive by the municipality . The strategic location of the proposed ecological, and programmable space will act as a gateway into a network of boardwalks and bike trails that weave through both active and passive recreational amenities through the woods and beach.

Generating a fun place where children feel comfortable and safe, the intervention aspires for both young and old the forest achieved its goal to improve safety, inclusivity, and accessibility for all.

The hub hopes to provide the community of Vlore with access to nature, gathering places, public space amenities, habitat restoration and vital infrastructure to ensure a healthy and thriving city well into the future.

Author

Map 47 - The Hub Plan

AXONOMETRIC VIEW OF THE PROPOSED DESIGN
THE PROTECTED WALKWAY, RECREATION & CULTURAL
ZONE & PLAYGROUND

AXONOMETRIC VIEW OF THE PROPOSED DESIGNS LINKING WITH THE SECONDARY WALKWAY VERY CLOSE TO THE BEACH

Figure 129 - Enclosed within the Soda forest, and the accessibility from the city center and the beach make for a plethora of activities in the hub.

Figure 130 - The elevated walkway atop the giant dunes offers pristine views overlooking the forest and also houses the protected wet lands enclosing the endemic Albanian frog species.

Figure 131 - Render showing seating area, public stage and the cultural zone.

Figure 132 - The Hub in its entirety.

ZONA E QENDRËSISË 6.6

THE BUNKER AT ZVERNEC

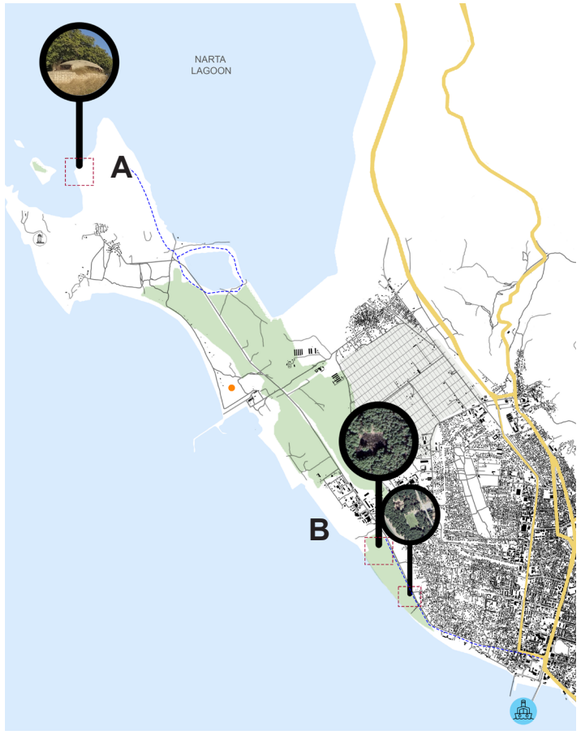
The area of Zvërnec belongs to the Protected Landscape of Vjosë-Nartë, established in 2004 by the Council of Ministers. It has been classified as a category V Protected Area (Protected Landscape/ Seascape) by the International Union for the Conservation of Nature (see INCA, 2018) and has been included in the candidate sites list of the Council of Europe's Emerald Network.

It also houses an old military bunker built during the communist regime and was chosen as the site for intervention.

On a small island within the Narta Lagoon, the Zvernec Monastery appears before hundreds of pine trees. In fact, this area is home to more than 1% of the bird population in the region of Vlorë, for atotal of over 34,000 specimens (Kashta et al., 2010). For this reason, it was declared an "Important Bird and Biodiversity Area" by BirdLife International and proposed for obtaining the European Union "Natura 2000" status (Mladenov et al., 2017).

The regulations for the land, the building on it and the present use of it also proved to be challenging as it was difficult to have the right legislation and data to base our design on.. The land is owned by the municipality of Vlore, but the area falls under the RAPA (Regional Authority of Protected Areas) jurisdiction owing to its protected status, the bunker belongs to the Ministry of Defence, the power station and transformer housed in a concrete shelter belongs to the electricity company, and the illegal settlement by a citizen on the said land in a shipping container is owned by the latter.

Author



Map 48 - The map shows the chosen site of intervention at A, namely the island at Zvernec. The marker for B shows the recreational and protected hubs designed in the preceding pages. Map by Author

Figure 133 - The bridge to the monastery at Zvernec. (Author)

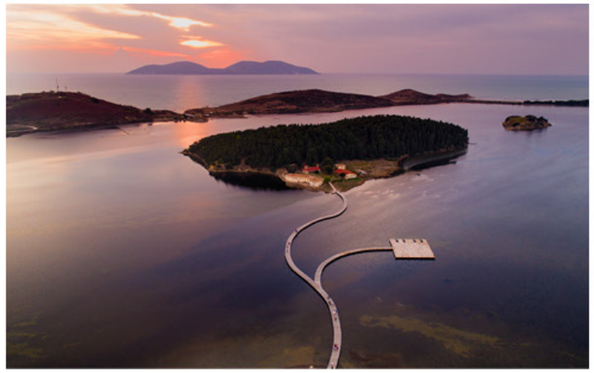


Figure 134 - Zvernec Island

Figure 135 - Migrating Flamingos (Celim)

Figure 136 - Pelicans & Flamingos at Zvernec overlooking the lagoon. (Celim)

Figure 137 - Bird watching at Narta Lagoon (Celim)

The photographs here showcase the aesthetic beauty of the island at Zvernec with the Sazan in the background.

The current bridge was built in more recent years and forks into two paths about midway through. The first of those leads to the old monastery. The second widens into a dock, where people can watch the native birds and locals come to fish the wide lagoon.

Right next to the entrance to the bridge, metal flamingos shoot out from the water. These are here because Narta Lagoon is known for its actual flamingos. After a long absence, the area is now said to be home to around 3,000 of these long-necked fellows.

It is an important bird watching sight visited by enthusiasts and researchers as well as tourists and locals.

Author

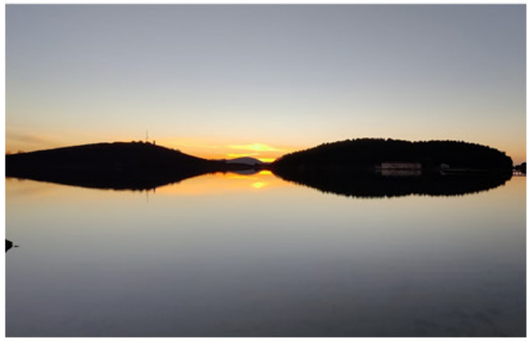


Figure 138 - Narta Lagoon & Zvernec Island (Author)

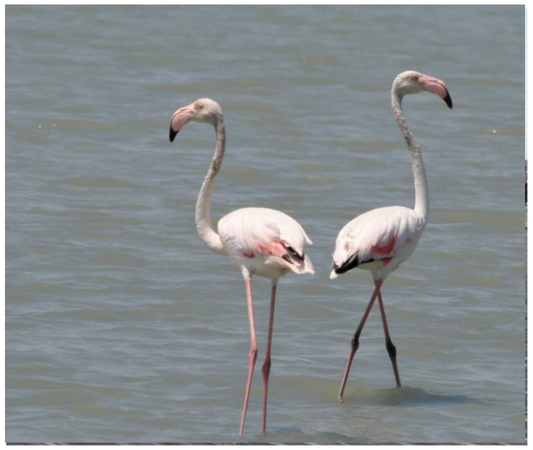


Figure 139 - Flamingos at the Narta Lagoon (Celim)

THE BUNKERED VIEW

The fourth hub was chosen at the Zvernec island essentially involving a bunker overlooking the lagoon and the island of Zvernec itself that houses an ancient monastery. The presence of a high number of tourists in the area during peak summer and no facility for a proper relaxation space and birdwatching drove the decision to introduce a seating area and a deck for photography and birdwatching.

This would reinforce the existing conditions at the site which has local business interests. The bunker itself would be transformed into an art piece by covering it with broken mirrors replicating the concept of Bunk Art reminiscent of the bunkers in Tirana which follow this successful model.

Thus, the intervention was proposed and dsigned and a meeting with the municipality officials ensured that it passed through the preliminary phase.

Author

Map 49 - The Bunker Masterplan

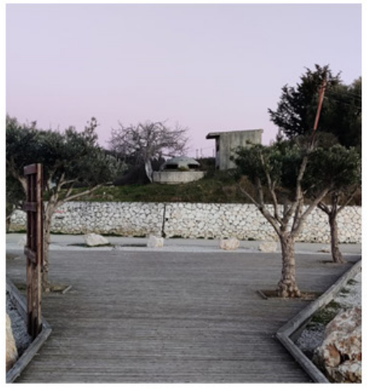


Figure 140 - Entrance to Zvernec Bridge

Figure 141 - The Bunker Site

Figure 142 - 200 year old Olive Tree on Site

Figure 143 - bunker Site Elements

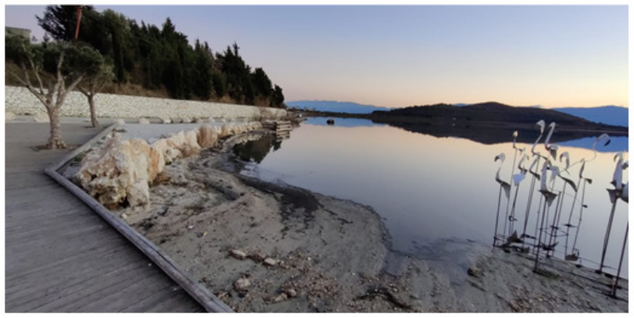


Figure 144 - Entrance to Zvernec Island

The chosen site in its current condition as showcased by the photographs. In addition to housing the historic bunker, the site is also home to a 200 year old olive tree, many of which are found at Zvernec and surround the Narta lagoon as seen in the earlier chapters of the dissertation.

Photos by Author

Figure 145 - The visual here showcases the proposed intervention of the site. The bunker has been covered with mirrors, becoming an attractor point for the visitors. The deck would serve as a platform for bird watchers and photographer enthusiasts.

Figure 146 - Addition of urban furniture and the shade of the olive trees provide for a beautiful view point overlooking the island of Zvernec with the monastery and the Sazan island in the background.

7. ARCHITECTURE

LIGJI JETËS

7.1

THE LIFELINE

The Lifeline uses physical space - buildings and its unique surroundings of the beach, forest and city to meet numerous goals, both physical and social.

It incorporates community-serving facilities augmented to support residents, coordinate communication, distribute resources, and reduce carbon pollution while enhancing quality of life.

The Lifeline is designed to meet a myriad of physical and social goals by utilizing a trusted physical space namely the Resilience Hub, Community Center, an office enclosing a courtyard that allows for flexible transition, extension or privacy thus providing the users to effectively work at the nexus of community resilience, emergency management, climate change mitigation, and social equity while also providing opportunities for communities to become more self-determining, socially connected, and successful before, during, and after disruptions.

The Lifeline aims to serve communities in three operating conditions: Normal (>99% of the time), Disruption and Recovery.

Access to electricity, heating and cooling is ensured through a well organized spatial layout, technology incorporated in construction and the convinience for proximity to food, water, tools, resources, and sometimes shelter.

The project also provides for dedicated space to set up information and communication infrastructure to deal with logistical coordination with various partner groups including the government, educational centers, and NGO's that have an active presence in Vlore that would potentially provide aid and post-disruption support. The facility will also provide access to basic health and medical supplies in a first response kind of scenario.

The project is designed using flexibility and adaptability as driving factors that ensure its ability to enhance its capacity to provide service in all three operating conditions (everyday,disruption, and recovery) seeking to generate finances, sustainability, and social returns for the surrounding community.

Map 50 - Selected Site Area

7.2 PROJECT FEATURES

ADAPTABILITY

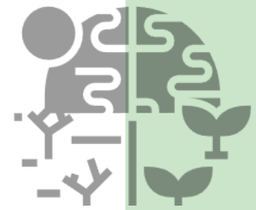
The Lifeline has the ability to adjust its mode of operations, employ extreme resilient measures or host a multitude of varied functions owing to spatial layout of the buildings that use an open and flexible floor plan layout. The hubs would also be able to function under electrical or thermal duress owing to the availability of in site power generation and storage and passive design features combing hybrid resilience systems for an optimized finctioning.

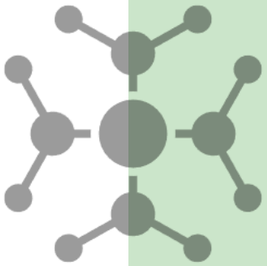
CLIMATE RESILIENCE

The building technology and strategies of the hub incorporates various sources including intensive studies and analysis of the environment, biodiversity and predicted outcomes to develop a community centered project that wiould anticipate, accommodate and positively adapt to or thrive amidst changing climate conditions or hazard events and to enhance quality of life, reliable systems, economic vitality, and conservation of resources for present and future generations.

RESILIENCE & COMMUNITY HUBS

The two buildings are community serving facilities augmented to support residents and coordinate resource distribution and services before, during or after a disruption. They leverage established, trusted, and community-managed facilities that are used year-round as neighborhood centers for community-building activities. They could also serve as pavillions for social and fund raising events, awareness campaigns or education centers in normal modes. They have the potential to reduce burden on local emergency response teams, improve access to public health initiatives, foster greater community cohesion, and increase the effectiveness of community-centered institutions and programs namely the chosen UN SDG's and DOP's.





VIZIONI
7.3

THE VISION

PUBLIC HEALTH & SAFETY

The Lifeline aims to help improve public health and well-being by streamlining health programming and resources at a community-trusted site. In the event of disruption, The hub will provide access to basic medical supplies and also act as a centers for medical deliveries and support for the city of Vlore.

ENVIRONMENTAL SUSTAINABILITY

The project would contribute to sustainability by offsetting grid-supplied power from solar and storage systems thus developing or protecting natural systems namely the Soda forest and the Adriatic sea which have been identified as key polluted sites by various stakeholders in the ongoing project, and reducing carbon emissions.

SOCIAL EQUITY

The hubs would be developed and managed through processes that shift power from the local municipality, namely Bashkia di Vlore to communities and community-based organizations within Vlore. The location of the project in the Soda forest along with the proposed intermodal hub is in close proximity with priority populations and the opressed Roma community. The Roma and the native population of Vlore in the area are at a greater exposure to climate hazards and the hubs would mitigate such an effect. Services, resources, and opportunities available at hubs should meet the needs identified by community members and focus on addressing disproportionate access to opportunities and resources.

ECONOMIC STABILITY

By providing resources and tools in normal conditions and working directly with the community of Vlore through recovery from disruptions, the resilience hub seeks to help low-income residents and the Roma minority to reduce financial impacts that occur during and after disruptions also allowing them access to a recognized active and passive income sources.

COMMUNITY COHESION

The Lifeline and its resilience hubs offer a unique and proactive opportunity to advance local goals related to equity, GHG reductions, and adaptation in a manner that meets other important community needs. Moreover, the hubs can help to shift power to communities and enable them to plan, react, and recover without reliance on local government thus enabling a diversified, prioritized and timely reaction and implementation.

This sort of community-driven resilience would be a process where community members most impacted by racism, pollution, and political disenfranchisement hold power in the planning and implementation processes to ensure their priorities and concerns are integrated, prioritized, and addressed actively benefitting the residents of Vlore but more importantly of Albania as a whole.

FUNCTIONING OF THE HUBS

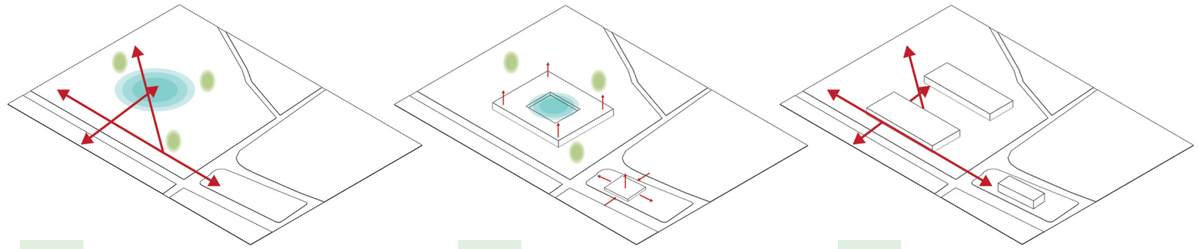
The Lifeline with its resilience hubs will function at “normal mode” most of the time, but is also intended as centers for preparedness, response, and recovery. A disaster response is functional when it invests in preparedness of individuals, community based organizations, and neighborhoods before a disruption.

In the event of a disruption, the hubs will switch from Normal Mode into reacting and responding to the disruption and will enhance operations to better support immediate community needs. With enhanced systems and capacity, the hubs can ideally help reduce the need of emergency services and better connect residents and businesses with supplies, information and support during a disruption.

The close proximity to the intermodal hub located across the project would also cater towards an extension of the hub should the need arise whilst also providing ample space for transportation and logistics of supplies.

After disruption, the hubs are ideally intended to switch into Recovery Mode. The same inequities frontline communities experience before and during a disaster tend to impact their ability to recover, let alone thrive, after a disruption. These hubs however will act as centers for resource deliveries and distribution, access to support and assistance for recovery processes and to access support services. The Lifeline aims to bea central location for external partners to gather and support recovery services.

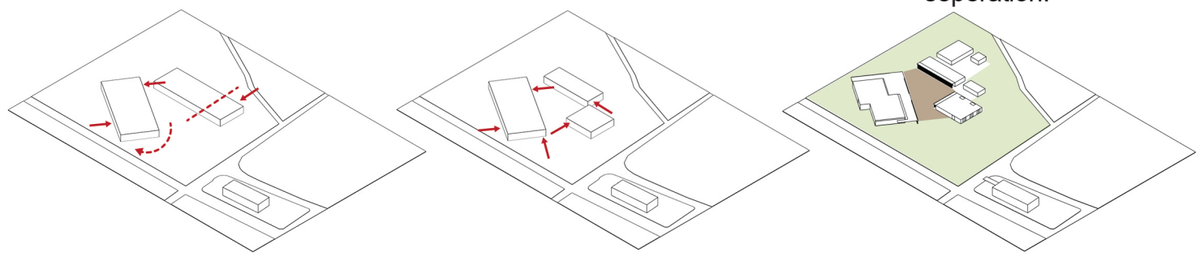
7.4 CONCEPT DEVELOPMENT



1 Axes , viewpoints & circulation.

2 Embracing courtyards for massing.

3 Visual and contextual connection through seperation.



4 Division of masses for functional programming.

5 Spacing & orienting masses for definition & language.

6 The final assemblage of volumes.

FUNKSIONET PËR PROJEKTIN

7.5

FUNCTIONS UNDER DIFFERENT MODES FOR THE LIFELINE

NORMAL FUNCTION	DURING DISRUPTION	RECOVERY FUNCTION
MEDICAL		
•Mental Health Counselling	•Mental Health Resources	•Mental Health Resources
•First Aid/ Response Supplies	•Access to Basic First Aid and Medical Supplies	•Distribution (Public Health Dept.) of Multi-Post Event
•Vaccination	•Hospital Personnel Assigned to Site •Mass Vaccination Center	
•Medical Advisory Services		
FOOD SERVICES		
•Kitchen+Meal Preparation Location	•Emergency Food Services	•Community Kitchen
•Storage Pantry	•Supplies for Making Food Onsite	
•Children's Food Services		
•Community Gardens & Greenhouses		•Community Healing Activity
CHILD & PET CARE		
•Play Space in Courtyard		
•Before+After School Care	•Child Care/ Activities	•Child Care Post Event Assist if Schools Closed
•Dog Parks, Cat Cafes, Pet Farm		
•Partnership with Shelters	•Therapy Animals	•Therapy Animals Assigned to Individual Families
WATER		
•Potable Water Stations	•Potable Water Filling Stations •Water Bottle Distribution •Ice Chests and Ice Disribution	
•Water Education		
•Grey Water Reuse for Gardens	Grey water Reuse for Bathrooms	
•Onsite Water Filtration	•Onsite Water Filtration	
•Solar Hot Water	•Solar Hot Water	
TRANSPORTATION		
•EV Charging Points	•Shuttles to the Hub	•Shuttles to Supply & Service Centers
•Bike Charging Station	•Evacuation Meet Up/Assistance	
•Car, Bike/Scooter Ride Share	•Shuttle to Shelter	
•Transit Accessible		

NORMAL FUNCTION	DURING DISRUPTION	RECOVERY FUNCTION
STORAGE & RESOURCES		
•Supplies & Tool Storage	•Supplies & Tool Storage for Community	
•Community Tool Library	• Sleeping Bags	
•Welfare Services & Programming		
•Water Storage Tanks	•Supply and Use	
WASTE MANAGEMENT		
•Site Trash Removal & Soda Forest	•Debris Cleanup Around Site	•Debris Removal and Assistance for Residents
•Site Recycling		
•Site Composting		
•Roma Minority Empowerment		•Roma Minority Empowerment
COMMUNICATIONS		
•Internet and Wifi/Computer Access	•Charging Stations	•Recovery Hub
•Meeting Location for community	•First Response Scenarios •Transition Services and Support	
•Radio and Media Access	•Authority Collaborations	
EDUCATION		
•Community Classes	•Strategic Gathering & Awareness	
•Awareness Campaigns		
•Vocational Courses		
•Roma Minority Empowerment		•Roma Minority Empowerment
GREEN INFRASTRUCTURE		
•Shade Trees		
•Permeable Pavers		
•Bioswales in Design		
•Greenroofs		•Community Healing
ENERGY		
•Weatherization		
•Energy Efficiency		
•Solar PV and Battery Backup	•Fuel Storage and Supply	
•Passive Cooling	Use	

HARTA E ZONIMIT

7.6

ZONING MAP

Green Open Spaces

Central Courtyard

Public Park with clustered seateing

Intermodality Hub

ZTL

P

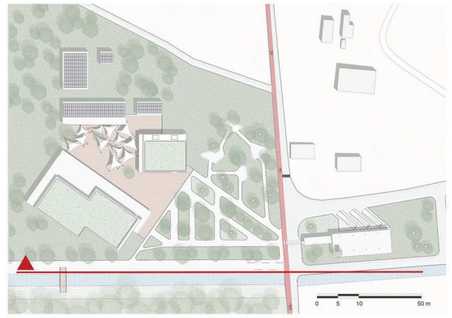
P

0 5 10 50 m

SEKSIONI URBAN

7.7

URBAN SECTION



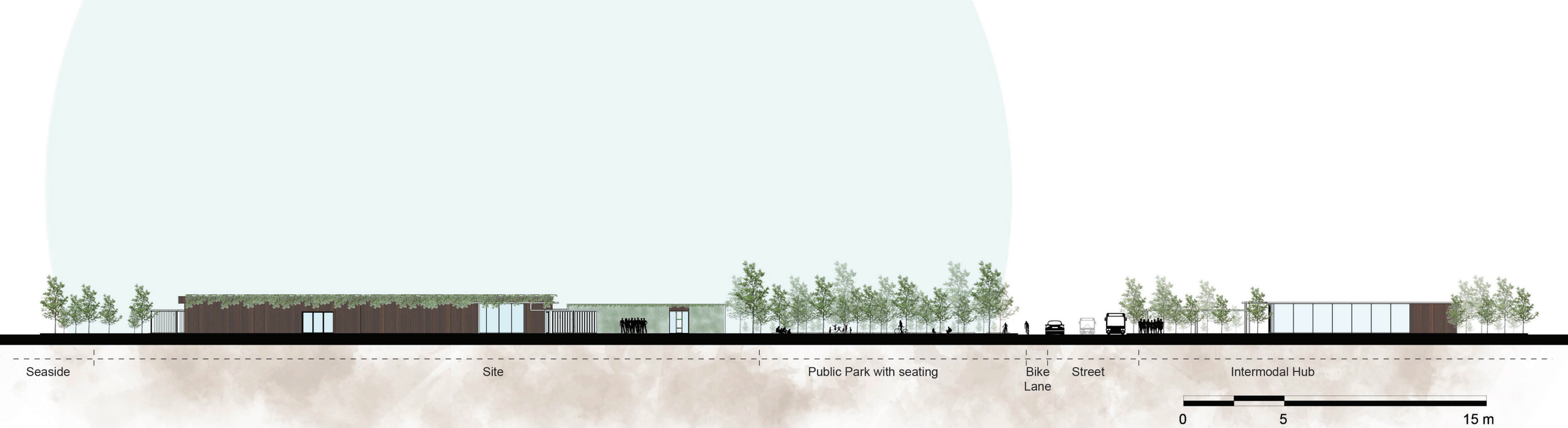


Figure 147 - Isometric View of The Lifeline

PLANI KRYESOR

7.8

MASTERPLAN

A: Resilience Hub
B: Community Engagement Center
C: Administration & Offices
D: Mechanical Rooms & water Tank
E: Intermodel Hub
F: Main Courtyard
G: Public park
H: Project Main Entrance

ZTL

0 5 10 50 m

Figure 148 - The buildings in The Lifeline embrace a central courtyard, where gathering and activities for large group of visitors take place. Sheltered outdoor spaces are also provided around the resilience hub, where small group activities and learning could be flexibly conducted amid the nature. The lawns surrounding the buildings with trees as natural shade also serve as ideal places for interaction. The characteristic use of materials and natural elements embrace nature and sustainability.

PLANIFIKONI

7.9

PLAN

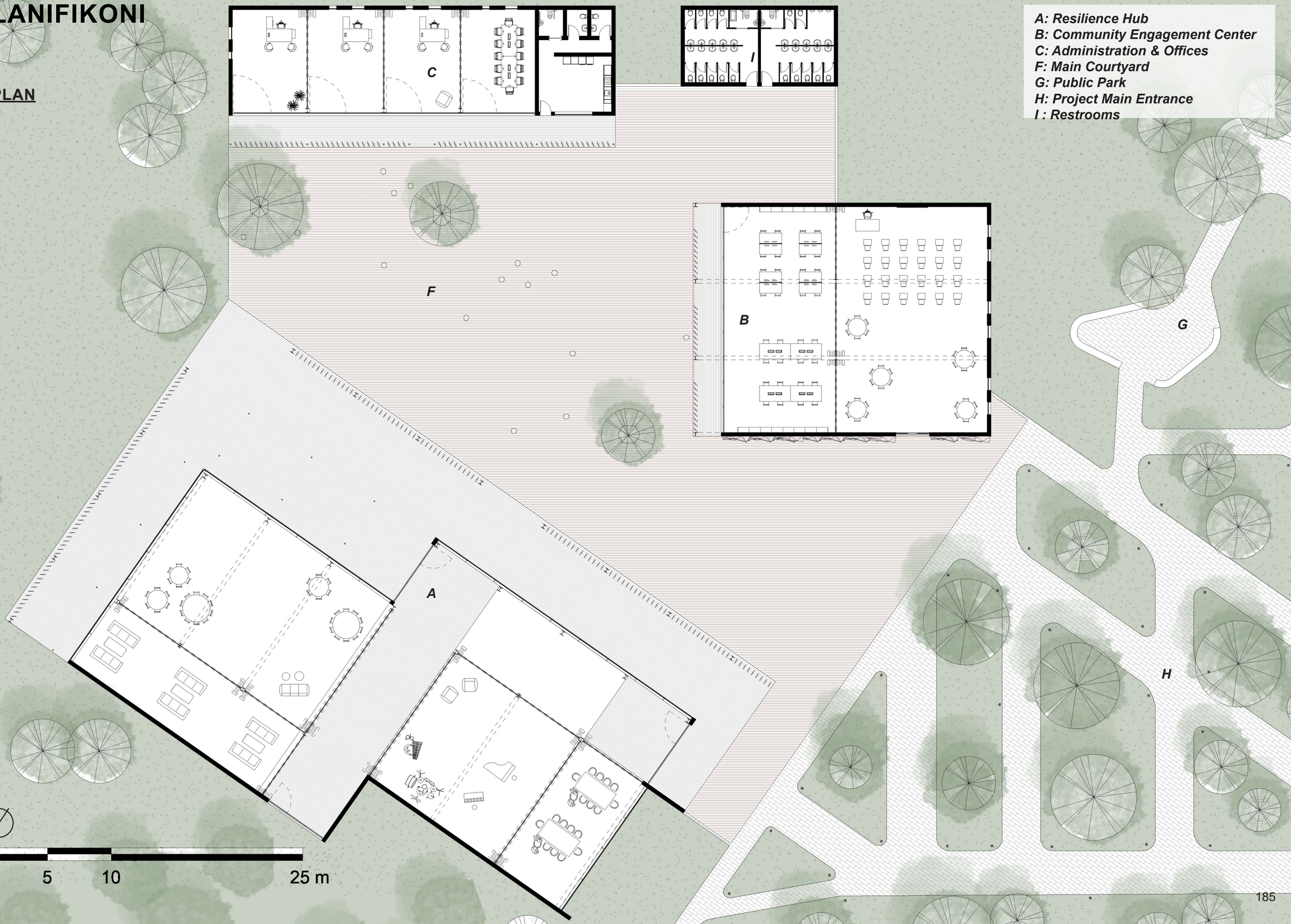
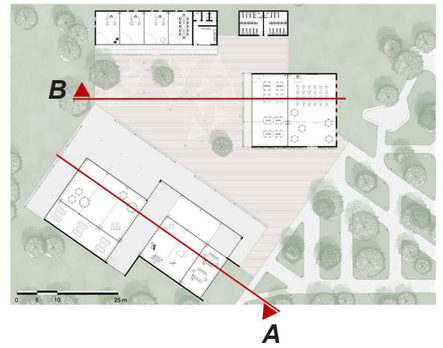


Figure 149 - The entrance to the Resilience Hub designed relates directly to the courtyard as a form of continuity between inside and outside. Together with the offices, community engagement center and other service areas.

SEKSJONET

7.10

SECTIONS



Section A-A

0 5 15 m

Section B-B

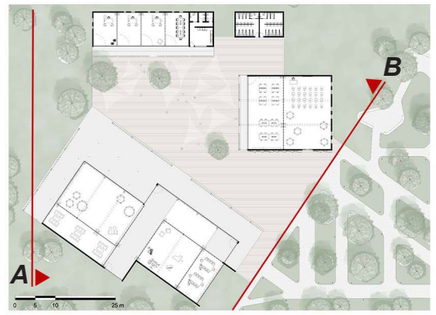
0 5 15 m

Figure 150 - Resilience Hub & Main Courtyard

LARTËSITË

7.11

ELEVATIONS



Elevation A-A

5m 20m

Elevation B-B

5m 20m

Figure 151 - A scenic entrance and path leads into the Soda forest eventually crescendoing to a magnificient beach.

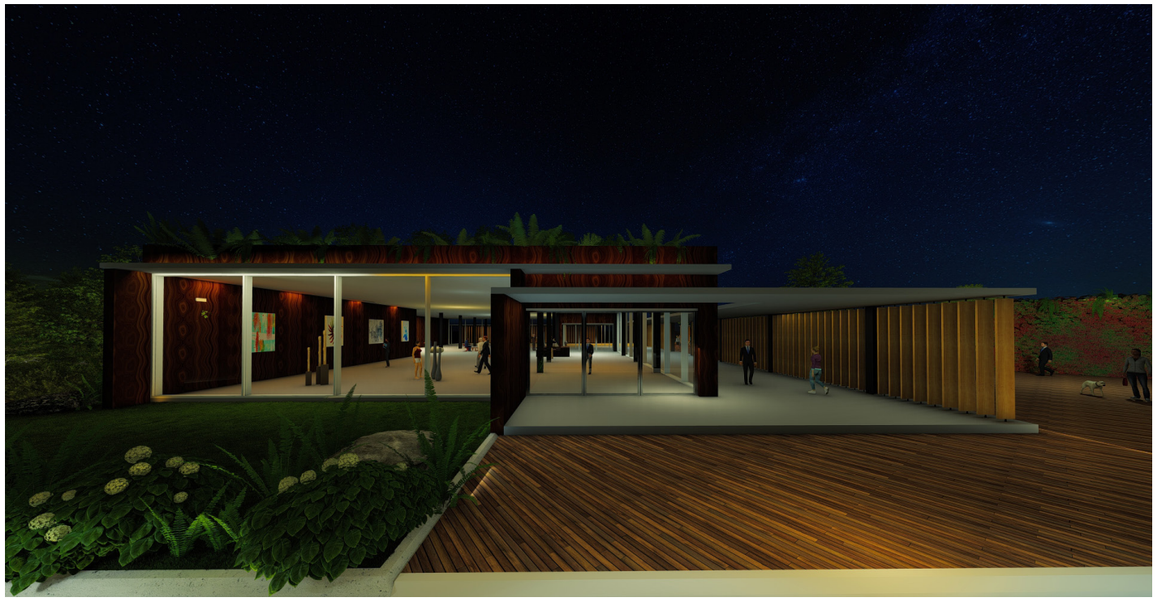


Figure 152 - Night View Resilience Hub Entrance

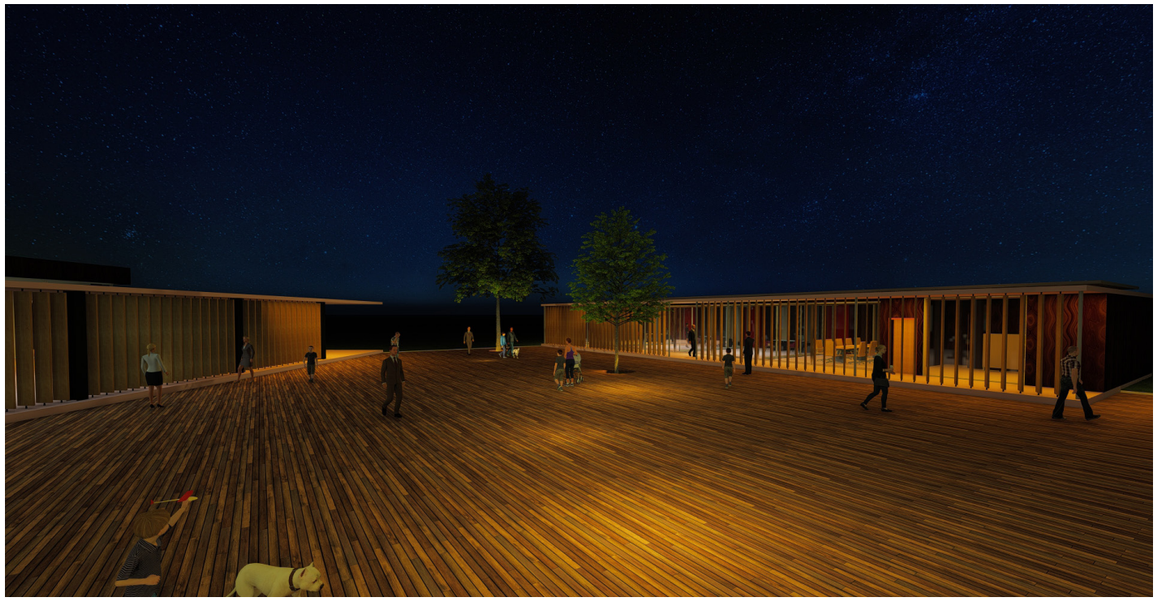


Figure 153 - The main courtyard leading into the beach and forest.

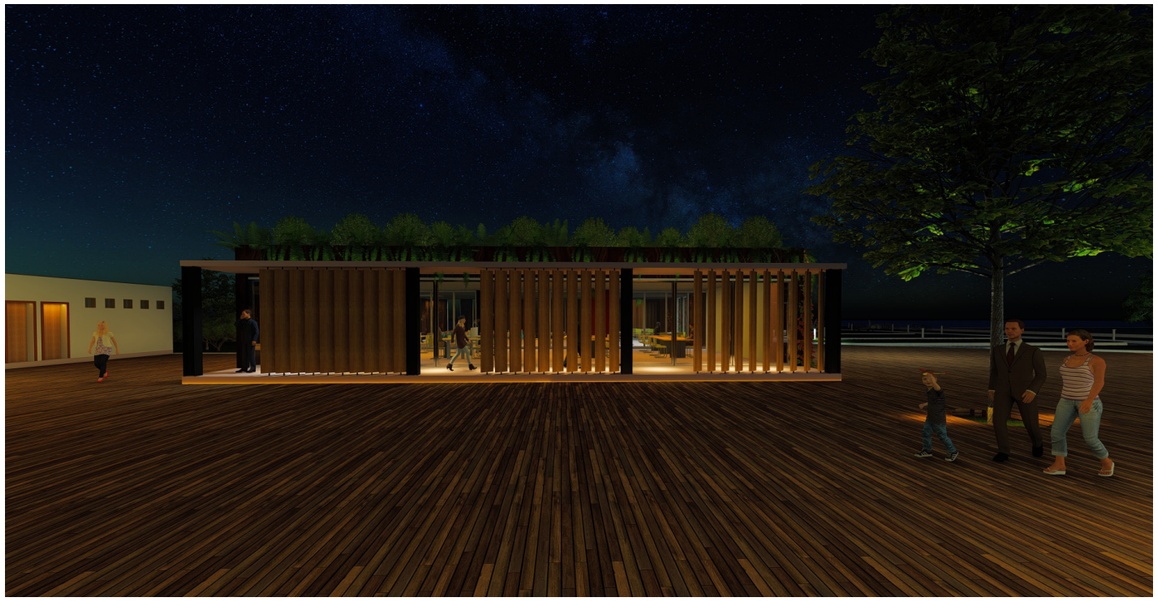


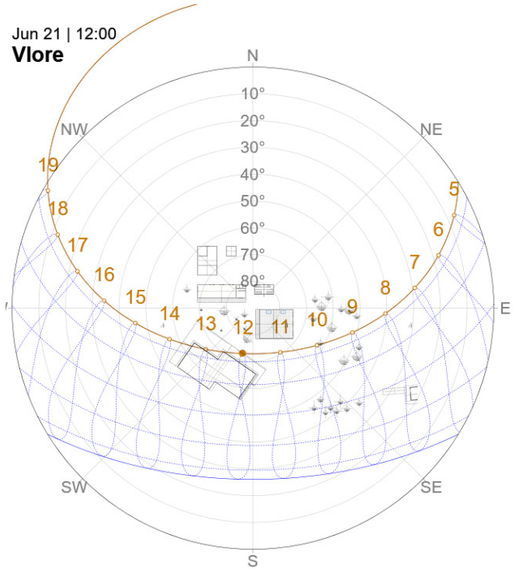
Figure 154 - The warm and ambient lighting invites visitors and users inside the Community Engament Center

8. BUILDING TECHNOLOGIES

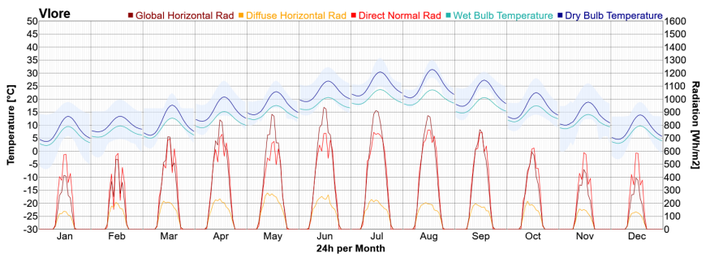
ANALIZA E KLIMËS 8.1

CLIMATE ANALYSIS

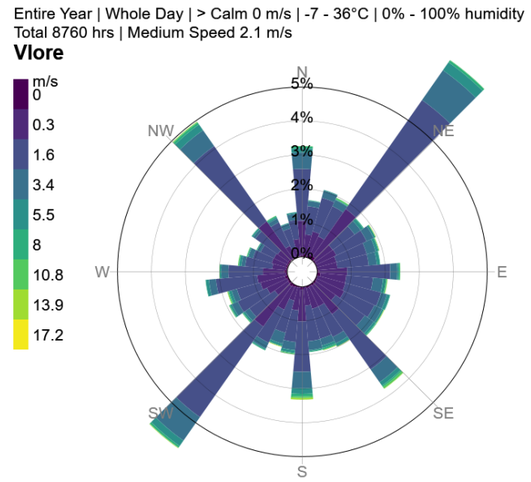
Graph 6 - Summer Solistice, Vlore



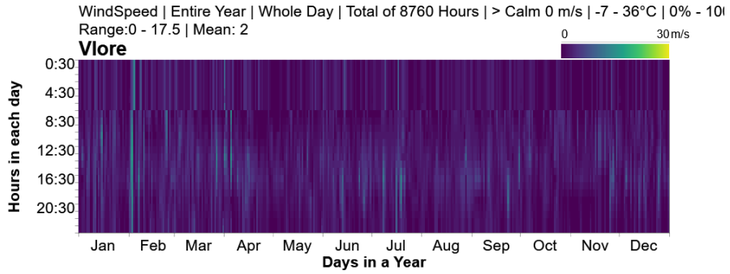
Graph 7 - Diurnal Averages Vlore



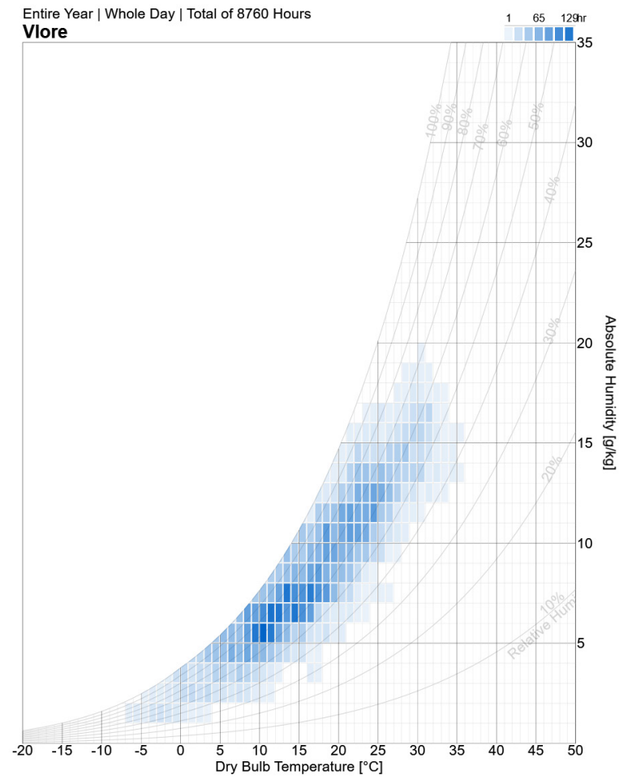
Graph 8 - Windrose Diagram, Vlore



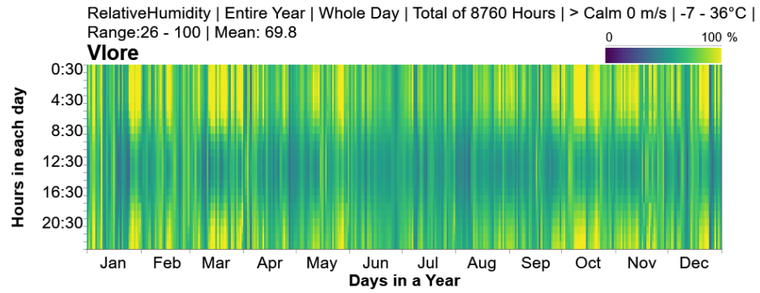
Graph 9 - Annual Wind Speed, Vlore



Graph 10 - Psychometric Chart



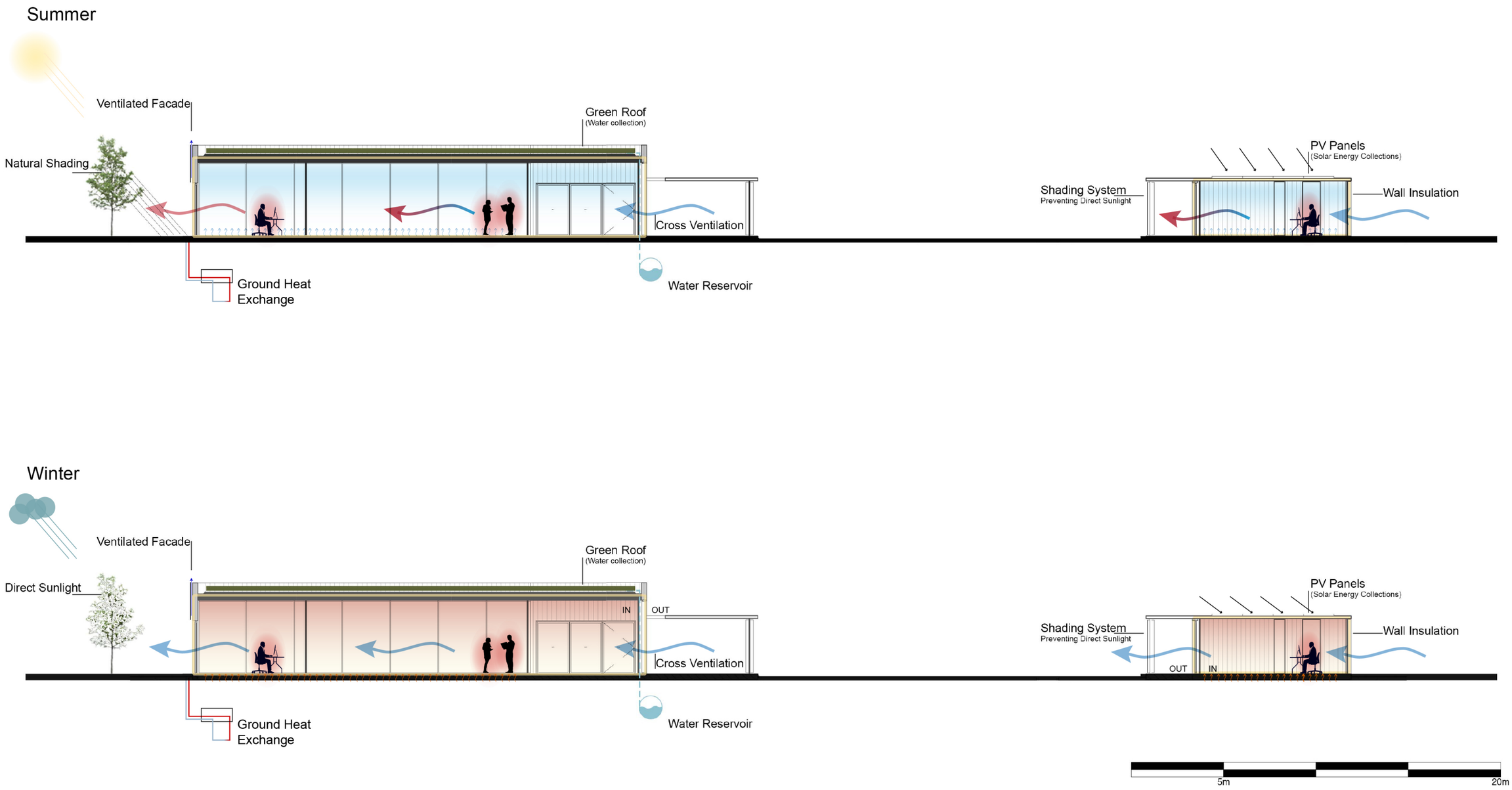
Graph 11 - Annual Relative Humidity



SEKSIONI SKEMATIK

8.2

SCHEMATIC SECTIONS



MENAXHIMI I UJIT

8.3

WATER MANAGEMENT

In addition to rainwater harvesting, grey water recycling is an excellent way to reduce water usage because it offers a means to use some water - specifically, grey water - more than once. In addition, the grey water reclamation system will redirect grey water into the soil for landscaping surrounding the project and also the Soda forest where it is naturally filtered - safely reintroducing into the environment without adding strain to a community's storm drain or waste water systems.

Lower overall water consumption

Reduce pressure on sewer and storm drain systems

Protect waterways

Prevent erosion

Grey water is simply waste water from activities like bathing, washing dishes, and laundry. It gets is name from its cloudy appearance, which is the result of detergents and food waste, and is generally recognized to make up at least 50% of a typical home's waste water.

Grey water does not include water from toilets, which contains human waste and is referred to as black water or sewage. Black water should never be reused for any application without extensive treatment first.

Grey water should contain only a limited amount of cooking waste. Waste water from dishwashers or sinks with garbage disposals is sometimes described as "dark grey," and requires additional filtering and settling before it can be used in typical grey water applications.

Grey water can also be obtained by harvesting rainwater. While rainwater does not have a grey appearance, when collected from roofs or patios it is not pristine enough to qualify as white water. It is, however, ideal for the same uses that grey water is.

Author

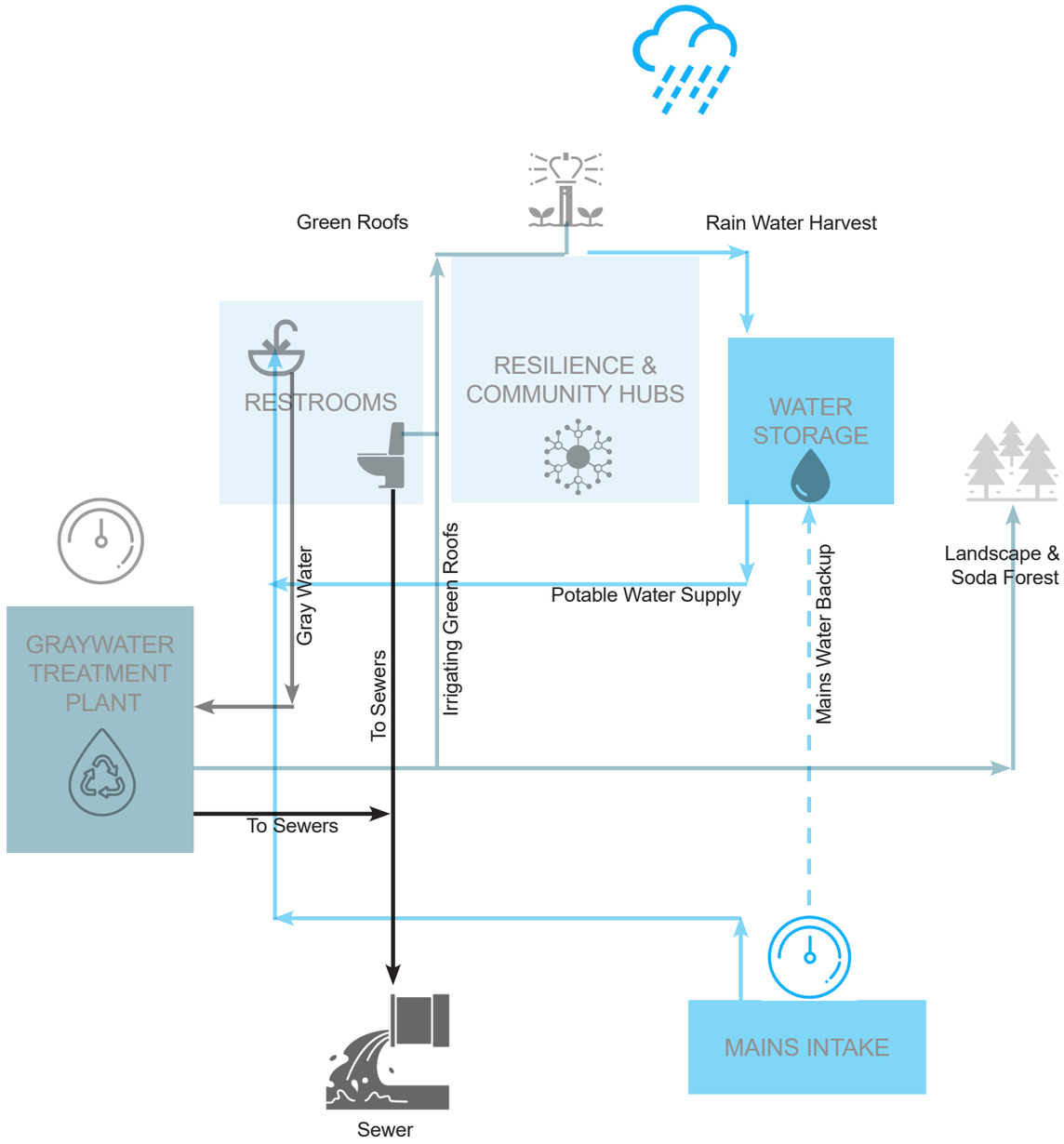


Figure 155 - The schematic represents the proposed water management system in the project.

ELEMENTE OPAKE

8.4

OPAQUE ELEMENTS

EXTERIOR WALL DETAIL

VERTICAL SECTION

MEG wood panel thickness 1.2 cm

Aluminum substructure

Waterproofing vapor brake membrane thickness 0.04 cm type Rothoblaas vaporvlines 120

Thermal insulation in rock wool thickness 6 cm type Knauf NaturBoard Partition type

Supporting panel in Xlam thickness 10 cm

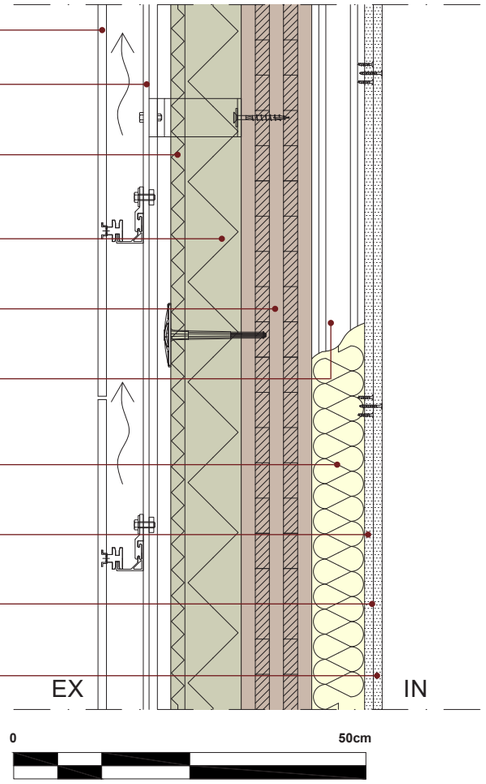
Galvanized steel metal uprights “C” type 50/75/50 steel pitch 60cm

Thermo-acoustic insulation in rock wool thickness 6cm

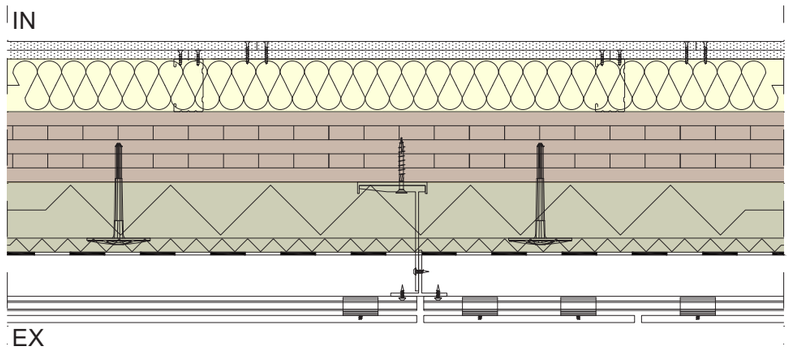
Plasterfiber sheet sp. 1.25 cm type Knauf

Steam barrier in aluminium thickness 0.0008 cm type ISOFOL

Knauf type plasterboard thickness 1.25 mm



HORIZONTAL SECTION



INTERIOR GROUND FLOOR

VERTICAL SECTION

Parquet Flooring Tiles 2 cm

Self-levelling radiant screed thickness 3 cm, type NE 425 Livellina

Radiant panel in shaped expanded polystyrene foam 2.5 cm thick coupled with a 0.1 cm thick galvanized steel diffusion plate, type Eurotherm euroslim

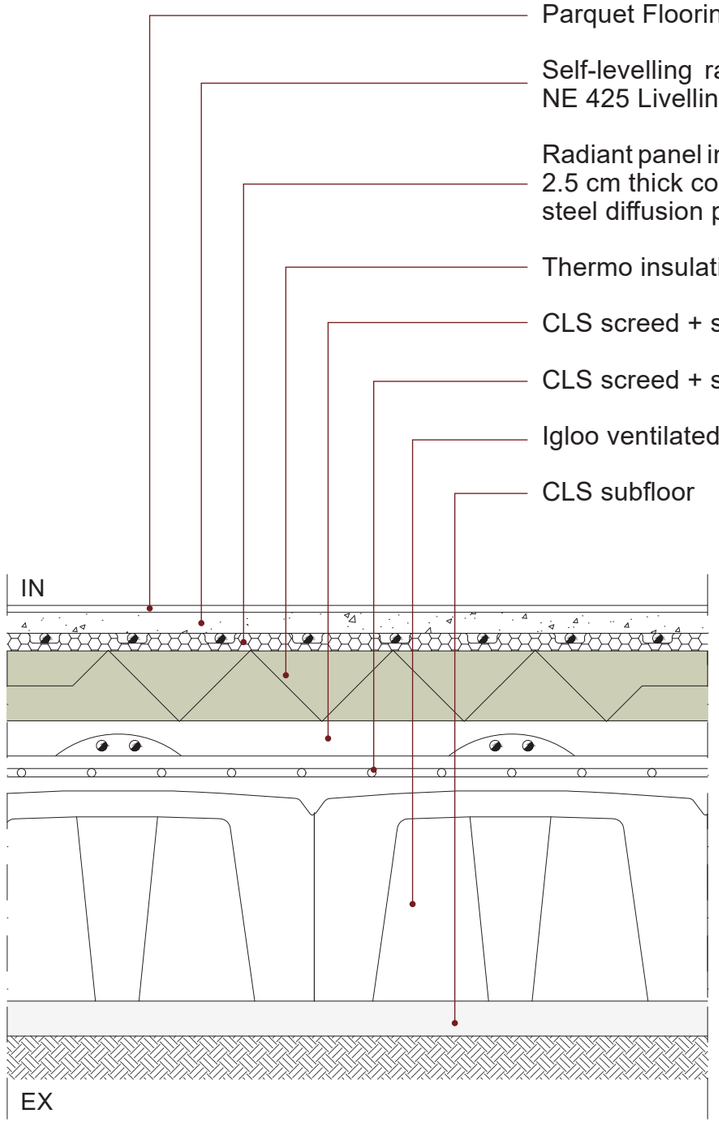
Thermo insulation rockwhool “Cosmos B” 10 cm

CLS screed + systems ducts 5 cm

CLS screed + steel grid 5 cm

Igloo ventilated system 30 cm

CLS subfloor



ELEMENTE OPAKE

8.4

ROOF

VERTICAL SECTION

WPC Pavement 2.2 cm / Novowood Prestige 197

Galvanized alluminium substructure 2 cm

Adjustable feet 3 cm to 10 cm

Waterproofing membrane (BPE) 0.4 cm / Bituver, Fleximat 4 mm D

OSB Panel 2 cm

Rock wool Anti-crushing and acustic insulation 2 cm / Rockwool Steprock LD

Rock wool thermo insulation 10 cm / Cosmos B

Xlam Supporting panel 7 layers 14 cm

Structural Steel Beam / IPE300

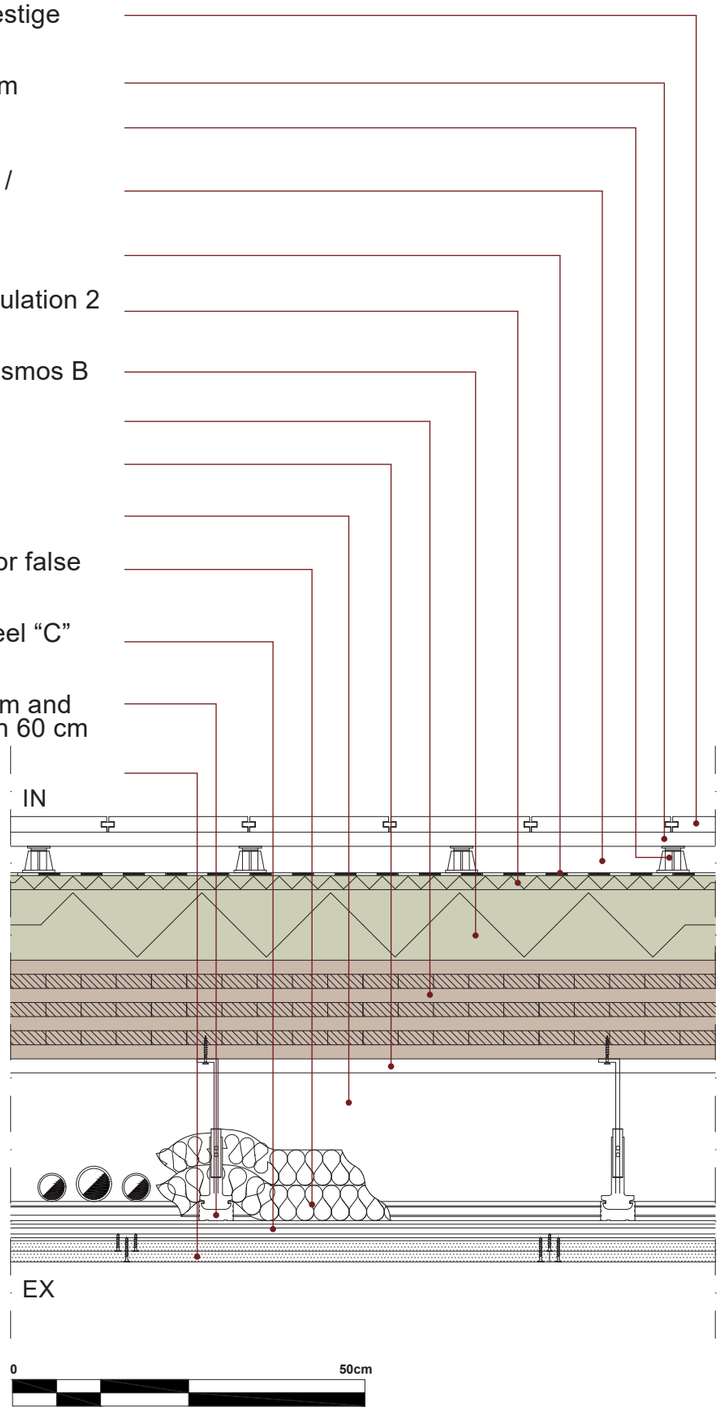
Air Cavity for air cooling 20 cm

Glass wool thermo-acoustic insulation for false ceilings 2x4.5 cm / Knauf Ekovetro P

Metal frame consisting of galvanized steel “C” profiles, type 27/50/27 0.06 cm

Pendini in cooked galvanized wire 0.4 cm and nickel-plated hardened steel spring pitch 60 cm

Knauf Plasterboard 2X1.25 cm / Knauf Vidiwall



GREEN ROOF

VERTICAL SECTION

Ground with extention plantation 10cm

Drainage elements and collecting wather “CLIMAGRÜN, PECT 300”, sp: 0,2 cm

Antiroots membrane tyoe “CLIMAGRÜN, TELO ANTIRADICE”, sp: 0,5 cm

Elastomeric compound waterproofing membrane (BPE), thickness: 0.4 cm type BITUVER, FLEXIMAT 4 MM D.

Thermo insulation rockwhool “Cosmos B” 10 cm

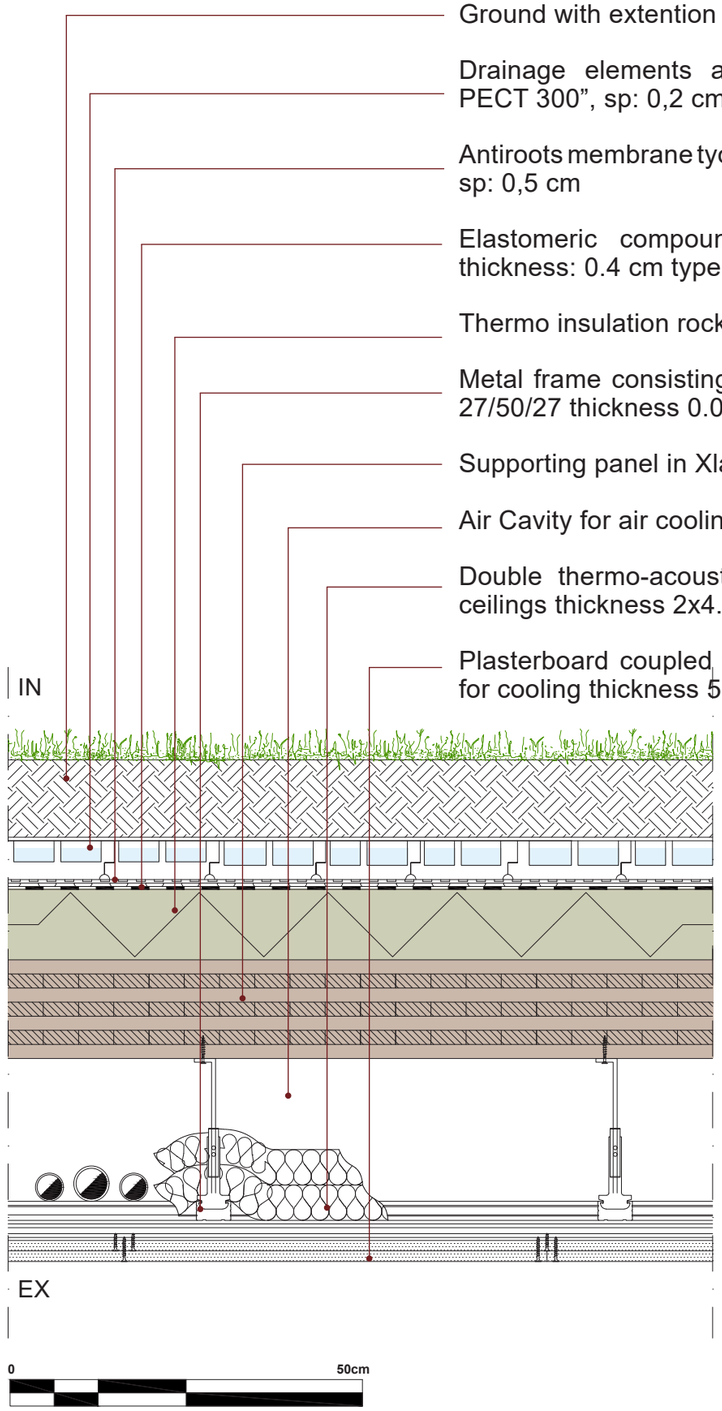
Metal frame consisting of galvanized steel “C” profiles, type 27/50/27 thickness 0.06 cm.

Supporting panel in Xlam 7 layers thickness 14 cm

Air Cavity for air cooling system thickness 20 cm

Double thermo-acoustic insulation in glass wool for false ceilings thickness 2x4.5 cm, type Knauf Ekovetro P

Plasterboard coupled with expanded polystyrene with pipes for cooling thickness 5 cm, type Eurotherm Leonardo



ELEMENTE OPAKE

8.4

GROUND - CURTAIN WALL CONNECTION

VERTICAL SECTION

Double glass with argon

Curtain wall mullion

Parquet

Self leveling radiant screed 3cm

Expanded polystyrene foam radiant panel 2.5cm, 0.033 W/mK

Rock wool anti crushing acustic insulation 2cm, 0.036 W/mK, 100 Kg/m³

CLS screed + duct system 5cm and CLS screed + steel grid 5cm

Igloo ventilated system 30cm

Cellular glass, 0.36 W/mK, 100Kg/m³

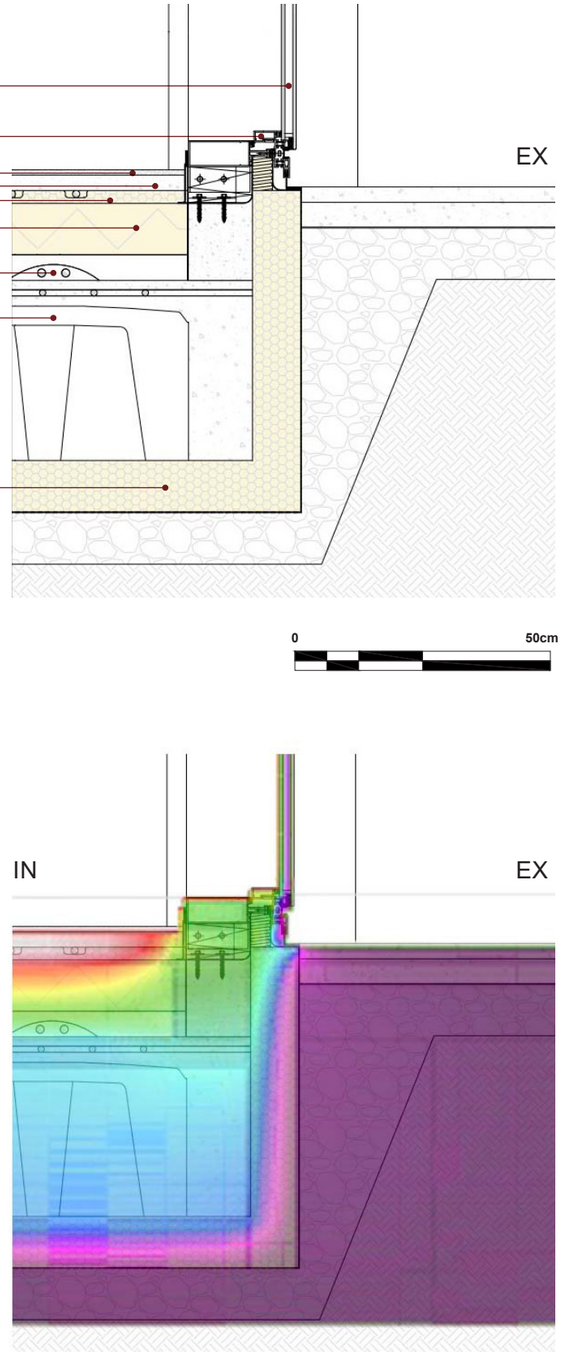


Figure 156 - Thermal Analysis via THERM.

ROOF-WALL CONNECTION

VERTICAL SECTION

WPC Pavement 2.2 cm / Novowood Prestige 197

Galvanized alluminium substructure 2 cm

Waterproofing membrane (BPE) 0.4 cm / Bituver, Fleximat 4 mm D

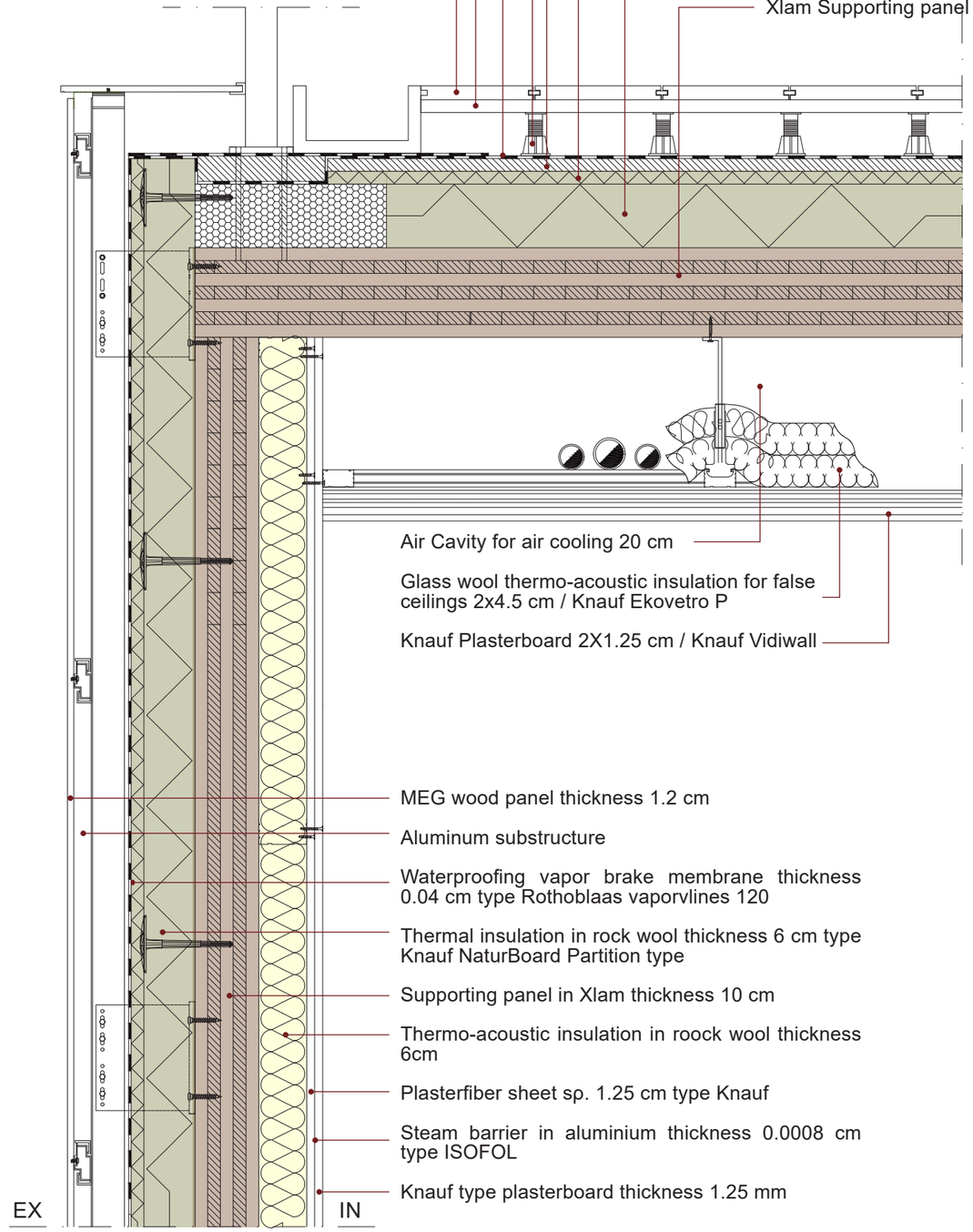
Adjustable feet 3 cm to 10 cm

OSB Panel 2 cm

Rock wool Anti-crushing and acustic insulation 2 cm / Rockwool Steprock LD

Rock wool thermo insulation 10 cm / Cosmos B

Xlam Supporting panel 7 layers 14 cm



STRUKTURAT 8.5

STRUCTURES

MATERIAL CHOICE

The XLAM panel (to be read: “cross-lam”, where “X” indicates the orthogonal arrangement of the wooden elements that make up the panel) or CLT (Cross Laminated Timber) is an engineered timber product made of glued wooden layers staked crosswise. The XLAM panel is used as a load-bearing wall, floor, roof or as a partition element.

This construction technique was developed in the Germanicspeaking area in the 90s and spread rapidly across the rest of Europe (today the market also reaches countries outside of Europe). It is based on the use of solid wood laminated panels that are produced by XLAM DOLOMITI with variable thickness from 57 to 297 mm and maximum dimensions of up to 3.5 meters wide and 13.5 meters long.

The XLAM panel is made up of layers which are very similar to those used for the manufacture of glued laminated timber, which, instead of being glued together in order to form linear bearing elements (beams, arches, portals), are arranged in crosswise layers as in plywood.

In Italy and Europe, the species of wood mainly used for the boards of the XLAM panels is the Spruce, a sofwood tree forming extensive forests in the Alps and more generally in Central and Northern Europe, with excellent mechanical properties intended for structural use. XLAM DOLOMITI uses wood from forests with a certification of sustainable forest management and as far as possible, with preference being given to the use of wood from local sources of supply.

Figure 157 - XLAM

CHARACTERISTIC VALUES OF PANELS

Minimum strength class of C24 boards (European standard reference UNI-38/2009)
Characteristic density: 350 kg/m³, mean density: 420 kg/m³

MODULUS OF ELASTICITY		
Mean modulus of elasticity parallel to fibres	$E_{0,mean}$	11.000 Mpa
Characteristic parallel modulus of elasticity	$E_{0,05}$	7.400 Mpa
Mean perpendicular modulus of elasticity	$E_{90,mean}$	370 Mpa
Mean shear modulus	G_{mean}	690 Mpa

STRENGTH VALUES		
Bending strength	fm,k	24 Mpa
Tension parallel to grain	ft,0,k	14 Mpa
Tension perpendicular to grain	ft,90,k	0,4 Mpa
Compression parallel to grain	fc,0,k	21 Mpa
Compression perpendicular to grain	fc,90,k	2,5 Mpa
Shear	fv,k	4 Mpa

Table13 - XDOLOMITI Characteristic Values

STRUKTURAT 8.5

PROPERTIES

SEISMIC RESISTANCE
The structures are designed and built to ensure safety against static and dynamic actions. Buildings with the XLAM construction system are lighter and stronger and, if submitted to an earthquake, the strain of the destructive force caused by the shock is greatly reduced compared to a traditional construction. Providing greater safety for the people who live there as well as the possibility of saving the building after the earthquake (as has been scientifically proven by CNR-IVALSA with tests in 2006 and 2007 in Japan, in the re-search project SOFIE).

FIRE RESISTANCE
The structures can be designed and built in such a way that the load bearing structure guarantees a high fire resistance. Buildings with the XLAM construction system comply with the most current and strict requirements, thus ensuring, in case of fire, safety in the controlled evacuation of the building, without the loss of human life. There is even the possibility of saving the construction as its loadbearing structure (the XLAM panels), in some cases, is not affected by any type of structural and material damage (as has been scientifically proven by CNR-IVALSA with tests in 2006 and 2007 in Japan, in the re-search project SOFIE).

ENERGY EFFICIENCY
The structures are designed and built in view of to saving energy thanks to their excellent thermal performance and airtightness. Thanks to their natural insulation qualities, thermal inertia and the low thermal conductivity of the wood, XLAM panels actively contribute to the insulation of the building envelope that needs very little energy during heating (winter) and cooling (summer), especially when compared to a building with the traditional construction system (steel and rein-forced concrete).

MORE SPACE
For the same gross floor space, a wooden building provides about 6% more of internal usable surface area than any other construction systems.

SOUND INSULATION
The structures can be designed and built to ensure an acoustic comfort with even more stringent values than the minimum limits of the laws in force. For buildings with the XLAM construction system, the materials used in the stratigraphy (packets) of the walls and floors provide sound insulation and the inner surfaces ensure noise absorption.

ENVIRONMENTAL SUSTAINABILITY
When designing buildings with the XLAM system, the choice of different materials/components and the definition of the construction/technological elements takes place, in general, according to the criteria of eco-construction and energy saving. The use of wood in the bearing structure (the XLAM panel) and in the non-structural components (cladding, lining, finishes, etc.), from the point of view of sustainability, refers to the use of a renewable and abundant material coming from certificated forests, essential in protecting the climate as it absorbs CO2.

DURABILITY
The stereotype that a wooden building does not last over time is contradicted by many examples in the world of historical wooden buildings, centuries or even millennia old, which are still in use (bridges, entire buildings, partitions, floors). The degradation of wood, and therefore of the XLAM panel, can develop only under specific conditions, avoiding those, the material is preserved perfectly intact for centuries or even millennia. The key to obtaining buildings with the XLAM bearing structure, which are durable and deliver better performances, is represented by the integrated design (design + technology + materials + skills). This includes not only the static calculations, but also the dimensions of the energy and acoustic performances and related to the durability of the materials, accompanied by site execution methods which are accurate and faithful to the project.

FAVORABLE COSTS/
BENEFITS RATIO
The XLAM system, due to its intrinsic qualities and construction
methods, offers quality standards and time frames for the same amount of money, significantly greater than those of traditional building systems.

STRUKTURAT

8.5

GENERAL REQUIREMENTS FOR STRUCTURAL DESIGN

According to EN 1990:2002+A1:2005 (E) 2.1 (1) a structure shall be designed and executed in such a way that it will, during its intended life, with appropriate degrees of reliability and in an economical way
– sustain all actions and influences likely to occur during execution and use, and
– meet the specified serviceability requirements for a structure or a structural element.

The structure shall be designed such that deterioration over its design working life does not impair the performance of the structure below that intended, having due regard to its environment and the anticipated level of maintenance. Lifetime for different categories is shown below in the table.

DESIGN WORKING LIFE CATEGORY	INDICATIVE DESIGN WORKING LIFE (YEARS)	EXAMPLES
1	10	Temporary structures
2	12-25	Replaceable structural parts, e.g., gantry girders
3	15-30	bearings
4	50	Agricultural and similar structures
5	100	Building structures and other common structures

Table14 - EN 1991:2002+A1:2005 (E)

According to EN 1990:2002+A1:2005 (E) 4.1.1 (1) actions shall be classified by their variation in time as follows:
- permanent actions (G), e.g., selfweight of structures, fixed equipment and road surfacing, and indirect actions caused by shrinkage and uneven settlements.

- variable actions (Q), e.g., imposed loads on building floors, beams and roofs, wind actions or snow loads.
- accidental actions (A), e.g., explosions, or impact from vehicles.

CHARACTERISTIC VALUES OF IMPOSED LOADS

To know loads of the building the category of use should be specified. According to EN 1991-1-1:2002 for residential buildings the characteristic value q_k (uniformly distributed loads) are 2,0 kN/m^2 for floors and stairs and 2,5 kN/m^2 for balconies.

CATEGORY	SPECIFIC USE	EXAMPLES
A	Ares for domestic and residential activities	Rooms in residential buildings and houses; bedrooms and wards in hospitals; bedrooms in hotels and hostels kitchens and toilets.
B	Office areas	Replaceable structural parts, e.g., gantry girders
C	Areas where people may congregate (except for areas defined under category A, B, and D)	C1: Areas with tables, etc. e.g., areas in schools, cafes, restaurants, dining halls, reading rooms, receptions. C2: Areas with fixed seats, e.g., areas in churches, theaters or cinemas, conference rooms, lecture halls, assembly halls, waiting rooms, railway waiting rooms. C3: Areas without obstacles for moving people, e.g., areas in museums, exhibition rooms, etc. and access areas in public and administration buildings, hotels, hospitals, railway station forecourts. C4: Areas with possible physical activities, e.g., dance halls, gymnastic rooms, stages. C5: Areas susceptible to large crowd, e.g., in buildings for public events like concert halls, sports halls including stands, terraces, and access and railway platforms.
D	Shopping areas	D1: Areas in general retail shops D2: Areas in department stores

Table15 - EN 1991-1-1:2002 (E)

STRUKTURAT
8.5

IMPOSED LOADS ON FLOORS, BALCONIES, AND STAIRS IN BUILDINGS

Categories of loaded areas	q_K [kN/m2]	Q_K [kN]
Category A - Floors - Stairs - Balconies	1,5 to 2,0 2,0 to 4,0 2,5 to 4,0	2,0 to 3,0 2,0 to 4,0 2,0 to 3,0
Category B	2,0 to 3,0	1,5 to 4,5
Category C - C1 - C2 - C3 - C4 - C5	2,0 to 3,0 3,0 to 4,0 3,0 to 5,0 4,5 to 5,0 5,0 to 7,5	3,0 to 4,0 2,5 to 7,0 (4,0) 4,0 to 7,0 3,5 to 7,0 3,5 to 4,5
Category D - D1 - D2	4,0 to 5,0 4,0 to 5,0	3,5 to 7,0 (4,0) 3,5 to 7,0

Table16 - EN 1991:2002+A1:2005 (E)

CHARACTERISTIC VALUES OF IMPOSED LOADS

Exterior walls				
N	Layer	Thickness (m)	Specific weight [kN/m2]	Weight [kN/m2]
1	Knauf type plasterboard	0.0125	7.75	0.097
2	Plasterfiber sheet	0.0125	1.75	0.022
3	Thermo-acoustic	0.06	0.25	0.015
4	Supporting panel in Xlam thickness	0.1	4.8	0.480
5	Thermal insulation in rock wool	0.06	0.3	0.018
6	Waterproofing vapor	0.004	2.08	0.008
8	MEG wood panel	0.012	4.5	0.054
Total		0.261		0.694

Table17 - Permenant Load for Exterior Walls

Green Roof				
N	Layer	Thickness (m)	Specific weight [kN/m2]	Weight [kN/m2]
1	Plasterboard coupled with expanded polystyrene	0.05	1.2	0.06
2	Double thermo-acoustic insulation in glass wool	0.09	0.3	0.03
3	Supporting panel in Xlam 7 layers	0.14	4.8	0.67
4	Thermo insulation rockwhool	0.1	0.3	0.03
5	Elastomeric compound waterproofi ng membrane	0.004	3.9	0.02
6	Antiroots membrane tyoe	0.005	3.9	0.02
7	Water accumulation and drainage panels	0.082	0.3	0.02
8	Soil for vegetation	0.1	-	0.95
Total		0.571		1.80

Table18 - Permenant Load for Green Roof

Roof				
N	Layer	Thickness (m)	Specific weight [kN/m2]	Weight [kN/m2]
1	Knauf Plasterboard	0.025	7.75	0.19
2	Glass wool thermo-acoustic insulation	0.09	0.25	0.02
3	IPE300	0.3	-	0.42
4	Xlam Supporting panel 7 layers	0.14	4.8	0.67
5	Rock wool thermo insulation	0.1	0.3	0.03
6	Rock wool Anti-crushing and acustic insulation	0.02	0.25	0.04
7	OSB Panel	0.02	6	0.12
8	Waterproofing membrane	0.004	2.08	0.01
9	Galvanized alluminium substructure	0.02	27.45	0.55
#	WPC Pavement	0.022	3.9	0.09
Total		0.741		2.14

Table19 - Permenant Load for Roof

STRUKTURAT

8.5

MECHANICAL PROPERTIES OF XLAM

It has been chosen XLAM structures of “Cross Timber System” with the following characteristics:

Intended Use	Primary as a wall, ceiling and roof elements
Maximum Width	3.5 m
Maximum Length	13.5 m
Maximum Thickness	40 cm
Layer Structure	At least three bonded single layer panels at right angles to each other
Wood Species	Spruce
Grade	C24 (for structural calculations)
Moisture Content	12%+/-2%
Bonding Adhesive	Formaldehyde-free PUR aadhesive
Service Quality	non-visual, industrial and visual quality, the surface is sanded
Appearance Grade	C or A/B in accordance with EN 13017-1
Weight	5.0kN/m^3 (for structural calculations)
Dimensional Stability: (panel size)	0.02% change for every 1% change in panel moisture content
Dimensional Stability: (panel thickness)	0.24% change for every 1% change in panel moisture content
Reaction to Fire	D-s2, d0 in accordance with Commission Decision 2003/43/EC
Resistance to Fire	Charring rate of 0.65 mm/min in acordance with EN 1995-1-2
Water Vapor resistance	20 to 50 in accordance with WN 12524
thermal Conductivity	0.13 W/(mK) in accordance with En 12524
Specific Heat Capacity	1600 J/(kgK) in accordance with En 12524
Service Class	1 and 2 only in accordance with EN 1995-1-1

Table20 - Mechanical Properties of XLAM

MECHANICAL PROPERTIES OF C24 TIMBER

Symbol	Value	Property
$E_{0,mean}$	11500 Mpa	Mean elastic modulus parallel to the grain
$E_{90,mean}$	370 Mpa	Mean elastic modulus perpendicular to the grain
$G_{0,mean}$	690 Mpa	Shear modulus parallel to the grain
$G_{90,mean}$	50 Mpa	Rolling shear modulus perpendicular to the grain
$F_{m,k}$	24 Mpa	bending strength parallel to the grain
$f_{t,0,k}$	14 Mpa	Tensile strength parallel to the grain
$f_{c,0,k}$	0.5 Mpa	tensile strength perpendicular to the grain
$f_{c,90,k}$	21 Mpa	Compressive strength parallel to the grain
$f_{v,k}$	2.5 Mpa	Compressive strength perpendicular to the grain
$f_{r,k}$	4 Mpa	Shear strength
$f_{T,k}$	1.0 Mpa	Rolling shear strength
p	2.5 Mpa	Torsional shear strength

Table21 - Mechanical Properties of XLAM

LOAD-DURATION AND MOISTURE INFLUENCES

According to EN 1995-1-1:2004+A1:2008 (E) 2.3.2.2 effect of moisture content on deformation is considered by the modification factor k_def selected for a given service class and it has an effect in the following way:

- For serviceability limit states, if the structure consists of members or components having diff erent time dependent properties, the final mean value of modulus of elasticity, Emean,fin, shear modulus Gmean,fin , which are used to calculate the final deformation should be taken from the following:

$$E_{mean,fin} = E_{mean} /(1+ k_{def})$$
$$G_{mean,fin} = G_{mean} /(1+ k_{def})$$

- For ultimate limit states, where the distribution of member forces and moments is affected by the stiffness distribution in the structure, the final mean value of modulus of elasticity, Emean,fin, shear modulus Gmean,fin, should be calculated from the following expressions:

$$E_{mean,fin} = E_{mean} /(1+ \Psi_2 k_{def})$$
$$G_{mean,fin} = G_{mean} /(1+\Psi_2 kdef)$$

Where:

E_{mean} is the mean value of modulus of elasticity

G_{mean} is the mean value of shear modulus

k_{def} is a factor for the evaluation of creep deformation taking into account the relevant service class

Ψ_2 is the factor for quasi-permanent value of the action

STRUKTURAT 8.5

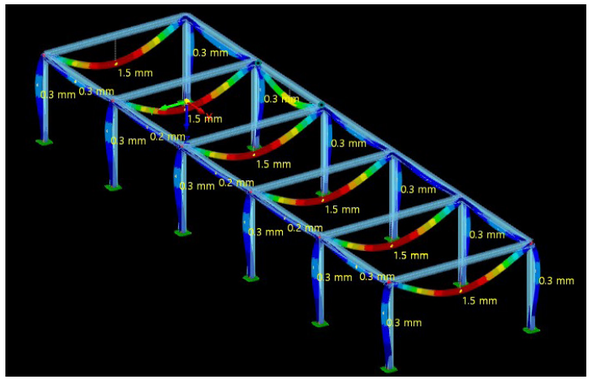
MECHANICAL PROPERTIES

$$E_{0,mean,fin} = \frac{E_{0,mean}}{1+k_{def}} = \frac{11500MPa}{1+0.6} = 7187{,}5MPa$$
$$E_{90,mean,fin} = \frac{E_{90,mean}}{1+k_{def}} = \frac{370MPa}{1+0.6} = 231{,}3MPa$$
$$G_{0,mean,fin} = \frac{G_{0,mean}}{1+k_{def}} = \frac{690MPa}{1+0.6} = 431{,}3MPa$$
$$G_{90,mean,fin} = \frac{G_{90,mean}}{1+k_{def}} = \frac{50MPa}{1+0.6} = 31{,}3MPa$$

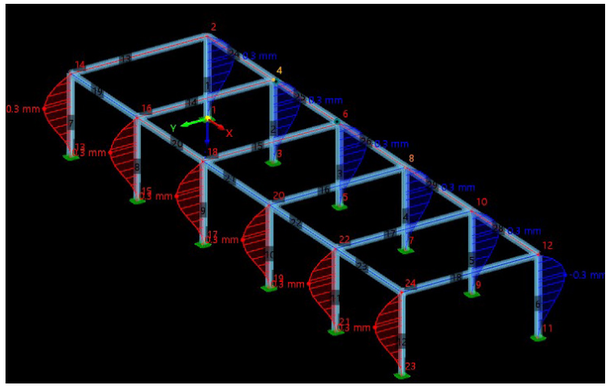
$$E_{0,mean,fin} = \frac{E_{0,mean}}{1+\Psi_2 k_{def}} = \frac{11500MPa}{1+0.3*0.6} = 9745{,}8MPa$$
$$E_{90,mean,fin} = \frac{E_{90,mean}}{1+\Psi_2 k_{def}} = \frac{370MPa}{1+0.3*0.6} = 313{,}6MPa$$
$$G_{0,mean,fin} = \frac{G_{0,mean}}{1+\Psi_2 k_{def}} = \frac{690MPa}{1+0.3*0.6} = 584{,}7MPa$$
$$G_{90,mean,fin} = \frac{G_{90,mean}}{1+\Psi_2 k_{def}} = \frac{50MPa}{1+0.3*0.6} = 42{,}4MPa$$

MOISTURE EFFECTS ON STRENGTH

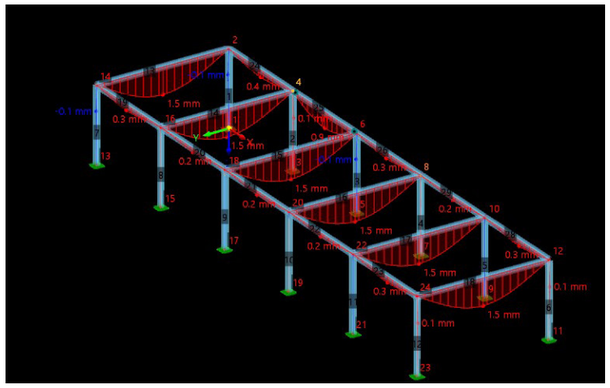
Effect of load-duration and moisture content on strength is taken into account by the modification factor k_mod The value of the parameter is selected on the basis of the relevant service class and load duration class according to EC5.



Global Deformation Scenario for the Offices building.

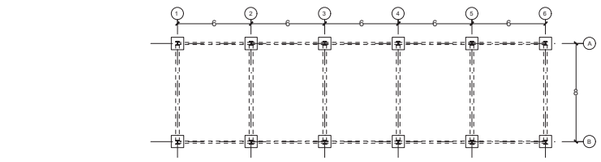


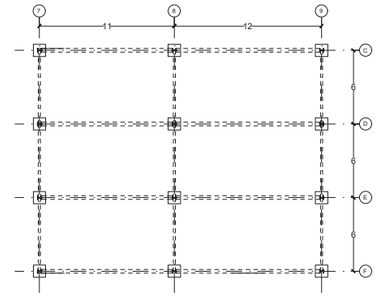
Moment Diagrams for the coloumns.

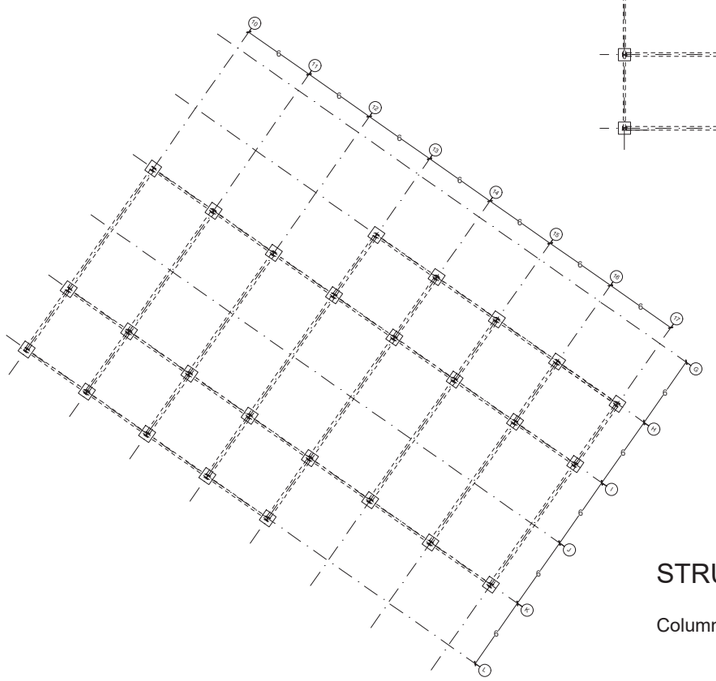


Moment Diagrams for the beams.

STRUCTURAL PLAN







STRUCTURAL ELEMENTS

Column structural element

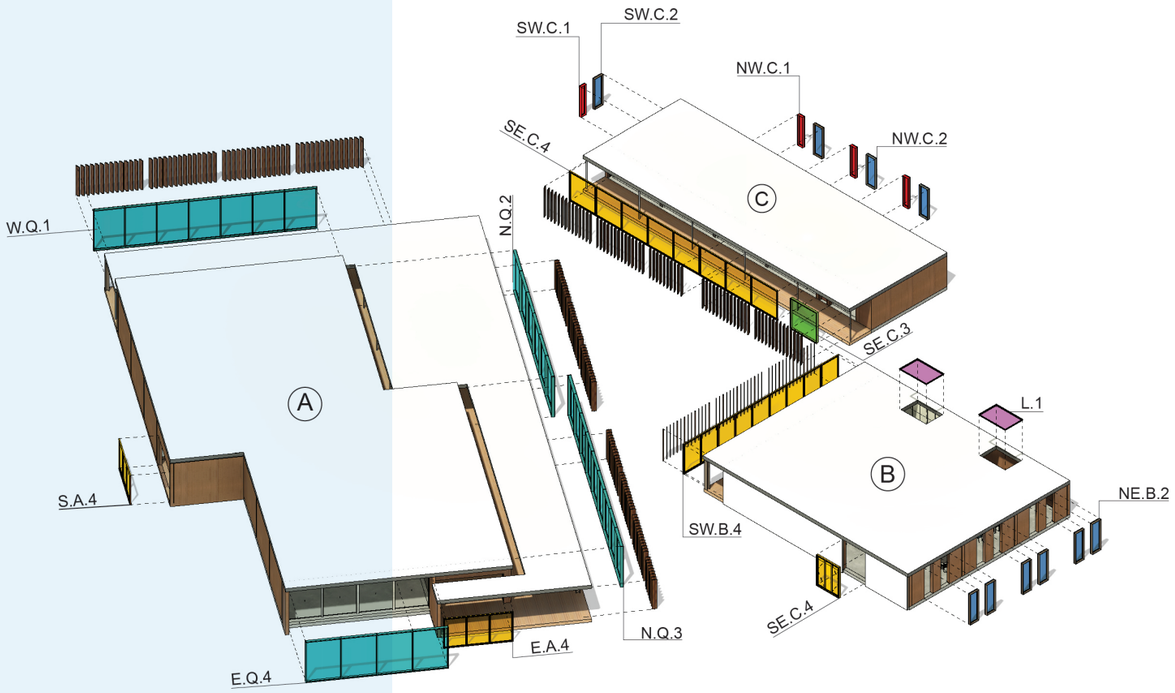
Primary beam structural element

Secondary beam structural element

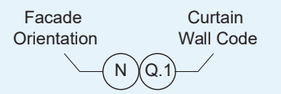
ELEMENTE TRANSPARENT

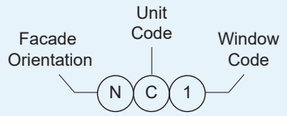
8.6

TRANSPARENT ELEMENTS

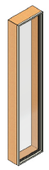
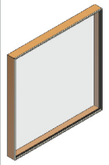
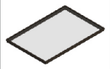


Legend





WINDOWS' SPECIFICATIONS

Window	Type	Quantity	Height cm	Width cm	Thichness cm	Material	U_w-value
	Triple	4	280	50	7.5	Solarban Glass	0.58
	Triple	10	280	100	7.5	Solarban Glass	0.58
	Triple	1	280	300	7.5	Solarban Glass	0.57
	Triple	2	200	300	7.5	Solarban Glass	0.57
	Triple	5	280	125	7.5	Solarban Glass	0.57
	Triple	4	385	300	8	Solarban Glass	0.57

ELEMENTE TRANSPARENT

8.6

SHADING SYSTEM

LOUVER PROPERTIES

Vertical Louver: R-400

Material: Aluminium Profile

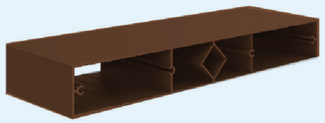
Louver Dimension: 5cm x 40cm

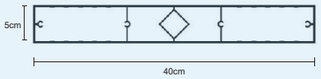
Opening Angle: 0 - 120

Height: 2.8m

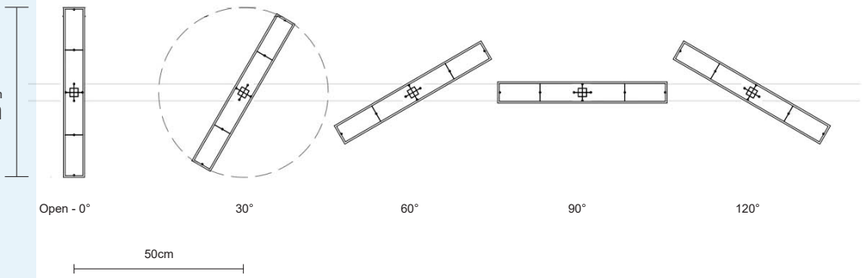
Structural profile: 8cm x 3cm

Manual Louver Rotation

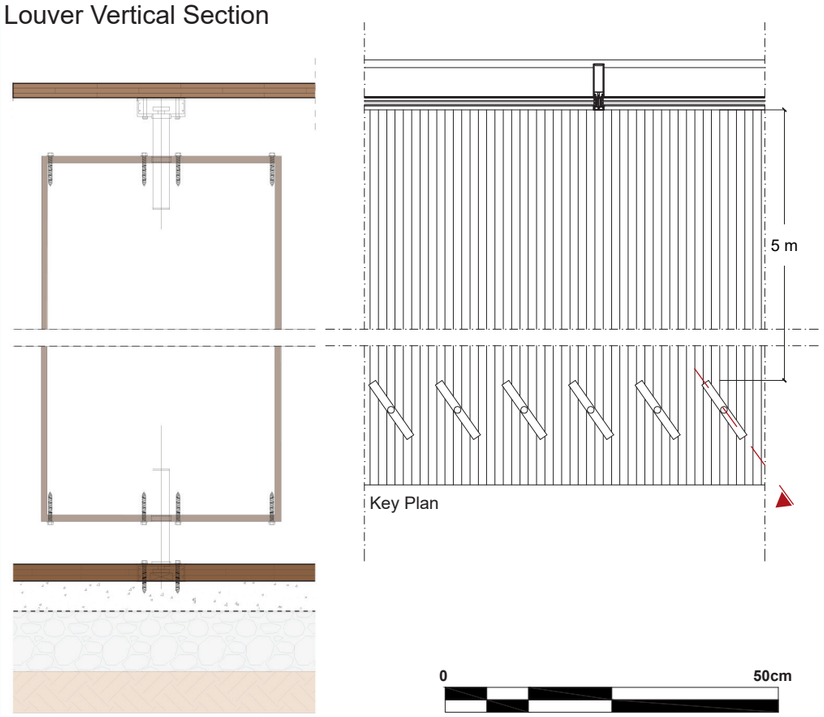




MOVABLE VERTICAL LOUVERS OVER STRUCTURAL PROFILE



Louver Vertical Section



CURTAIN WALL DETAIL

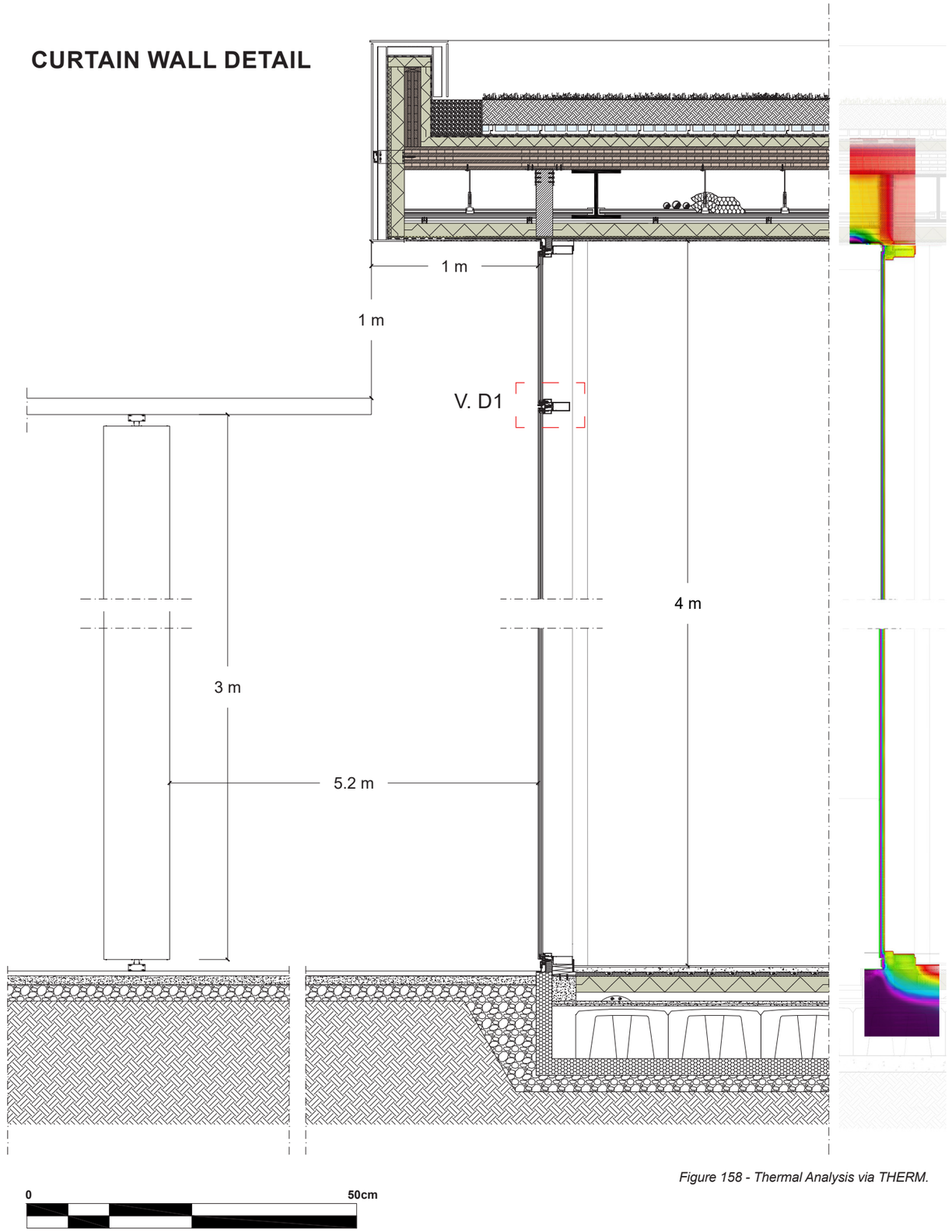
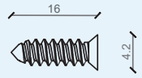
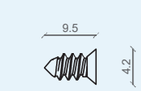
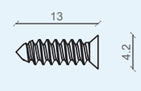
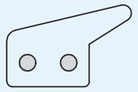
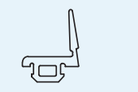
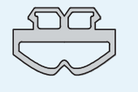
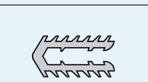
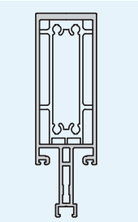
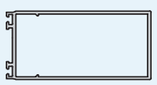
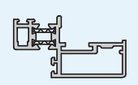


Figure 158 - Thermal Analysis via THERM.

ELEMENTE TRANSPARENT

8.6

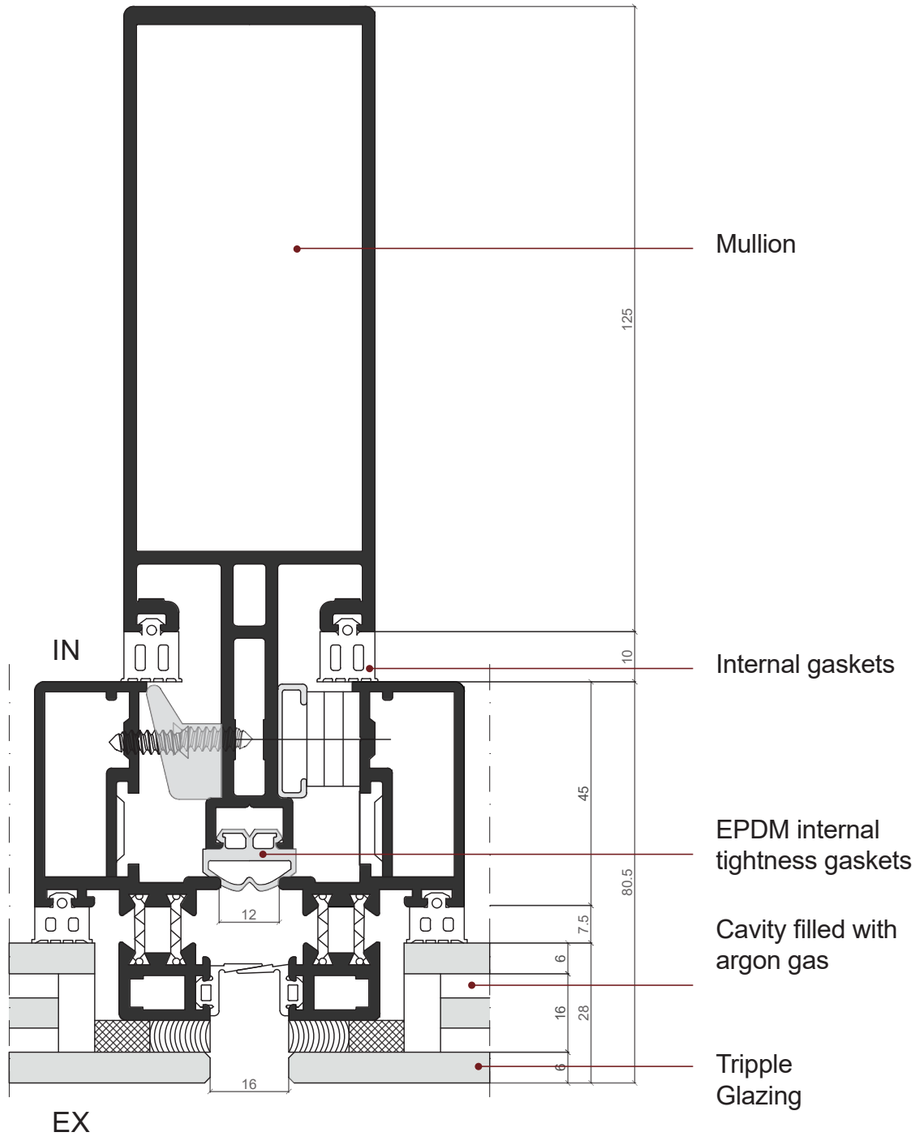
MULLION SPECIFICATION

	Ma 4100	Fixing element Self-drilling screw (TS 4.2 x 16) Material: Stainless steel
	Ma 4101	Fixing element Self-drilling screw (TS 4.2 x 9.5) Material: Stainless steel
	Ma 4144	Fixing element Self-drilling screw (TC 4.2 x 13) Material: Stainless steel
	Ma 4284	Fixing Accessories for fixed side frame Material: Stainless steel
	Mg 526 D	Perimeter gasket for external tightening Material: EPDM (Dutral)
	Mg 527 D	Internal tightening gasket Material: EPDM (Dutral)
	Mg 556 D	Gasket for NC 5936 Material: EPDM (Dutral)
	Mg 533 D	Gasket for glass - for 6.5 mm room Material: EPDM (Dutral)
	NC 5991	Mullion 125 mm Weight: 3.194 kg/m External perimeter: 557 mm
	NC 6100	Transom 105.5 mm Weight: 2.163 kg/m External perimeter: 467 mm
	NC 6005	Sash and frame with glass in view Weight: 1.243 kg/m External perimeter: 273 mm

V. D1

The producer: METRA
The curtain wall is made up of an internal bearing structure, with a grid characterized by mounting principle of mullions and transoms.

Ug= 0.89 W/m²K
Uf=1.40 W/m²K
Ucw= 1.10 W/m²K



DRITËS SË DITËS

8.7

DAYLIGHT AVAILABILITY

This workflow supports the calculation of a variety of daylight availability metrics. As the name suggests, these metrics assess indoor illuminance distributions due to daylight – either under select conditions or throughout the entire year. Their purpose is to evaluate the sufficiency of daylight for carrying out work tasks and other indoor activities.

LEED V4 DAYLIGHT OPTION 1

Leadership in Energy and Environmental Design (LEED) is a green building rating system maintained by the US Green Building Council (USGBC). The system offers two simulation-based options for achieving its Daylight Credit. Option 1, described here, simulates daylight availability throughout the entire year, while Option 2 simulates daylight availability at two specific moments in time.

Option 1 yields a more complete description of daylighting performance, offers more potential points under the USGBC's rating system, and is the recommended compliance pathway for the LEED Daylight Credit and the project evaluated for the standards.

Five key metrics were analyzed in subsequent iterations

1. CREDITS

The number of points the building qualifies for. Points are based on the total spatial daylight autonomy (sDA) of all qualifying areas. Areas that receive too much direct sunlight (ASE) are automatically disqualified from the total under LEED version 4.0, though not under version 4.1. In the latter case, please note that ASE values above 10% must be justified in writing as part of the submitted report.

2. SPATIAL DAYLIGHT AUTONOMY (sDA)

The percentage of the regularly occupied floor area that is "daylit." In this context, "daylit" locations are those meeting target illuminance levels (300 lux) using daylight alone for at least 50% of occupied hours. Such locations are said to be 50% daylight autonomous. sDA calculations are based on annual, climate-based simulations of thousands of different sky conditions throughout the year. Per LM-83 guidelines, dynamic shading devices such as blinds or electrochromic glazings must be specified for all exterior window units.

	Version 4.0	Version 4.1
sDA ≥ 40%	-	1 Point
sDA ≥ 55%	2 Points	2 Points
sDA ≥ 75%	3 Points	3 Points

3. ANNUAL SOLAR EXPOSURE (ASE)

The percentage of the regularly occupied floor area that is "overlit." In this context, "overlit" locations are those receiving direct sunlight (>1000 lux directly from the solar disc) for more than 250 occupied hours. It is worth pointing out that ASE is calculated for the dynamic shading system fully opened all year, whereas sDA takes the operation of dynamic shading into account..Another strategy might involve specifying automated blinds or electrochromic glazing systems, which trigger ASE exemptions for adjoining rooms.

4. MEAN ILLUMINANCE

The average illuminance over the regularly occupied floor area over all occupied hours.

5. BLINDS OPEN

The average percentage of dynamic window area that is unshaded during occupied hours. This metric was an important indication of the frequency of blinds use in response to direct solar exposure
Lower numbers here indicate higher rates of blinds use, which correspond to lower daylight levels and reduced views to the outside. As with ASE, blinds operation can be minimized through passive design strategies such as building orientation, static shading, and reduced window-to-wall ratio.

ANNUAL GLARE

The project also accounted and calculated annual glare distributions across an occupied floor area for its various iterations.

These glare calculations are based on the Daylight Glare Probability (DGP) metric, developed by Wienold and Christofferen. DGP predicts the likelihood that an observer at a given view position and orientation will experience discomfort glare.

The metric is usually calculated using a fisheye rendering with an opening angle of 180 degrees. DGP can have values between 0% and 100%, which are divided into four bands:

Imperceptible Glare	DGP ≤ 34%
Perceptible Glare	34% < DGP 38%
Disturbing Glare	38% < DGP ≤ 45%
Intolerable Glare	45% < DGP

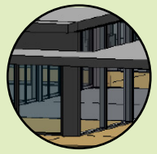
SPATIAL DISTURBING GLARE (sDG)

The percentage of views across the regularly occupied floor area that experience Disturbing or Intolerable Glare (DGP > 38%) for at least 5% of occupied hours.

The calculation is based on hourly DGP values for eight different view directions at each position in the building. The default view height is 1.2 meters off the finish floor (eye height for a seated observer).

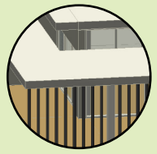
The frequency of disturbing glare is visualized in

BASE CASE - RESILIENCE HUB



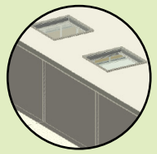
Horizontal Shading

N



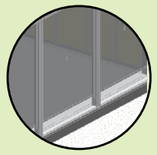
Vertical Shading

N



Skylights

N



Internal Shading

N

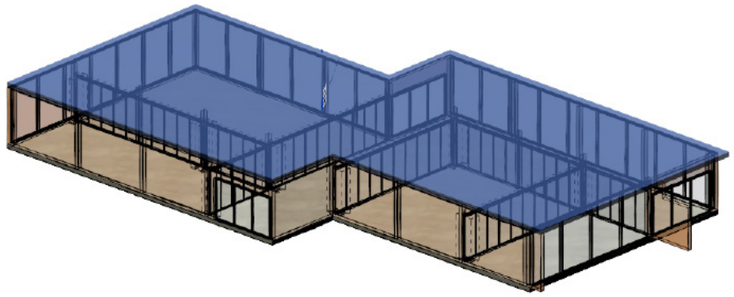
Occupancy
8 AM-6 PM DST

3 Credits

92.2% sDA

22.3% ASE

1650 avg. lux



Visualization of the building and set parameters.

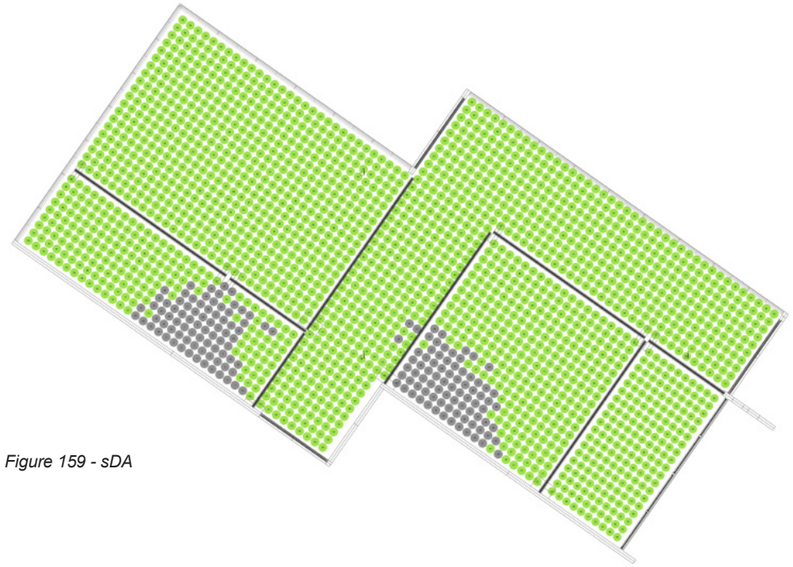
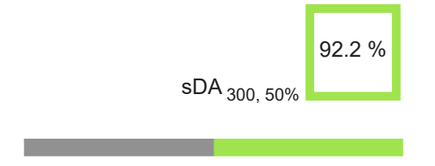
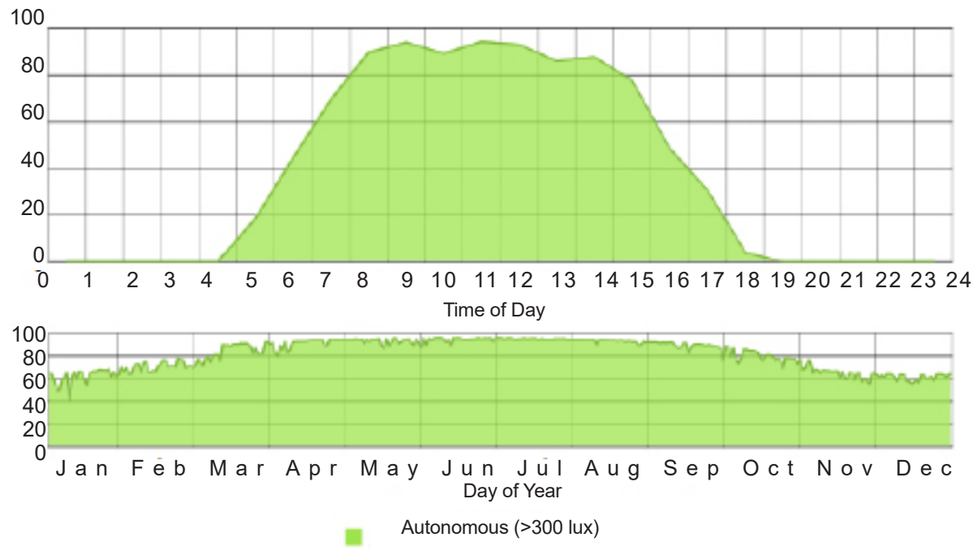


Figure 159 - sDA



BASE CASE - RESILIENCE HUB

The baseline case for the resilience hub with no horizontal & vertical shading elements. The building is overlit, with uncomfortable levels of illuminance and intolerable glare owing to the curtain wall sys-ytems.



Graph 12 - Annual sDA

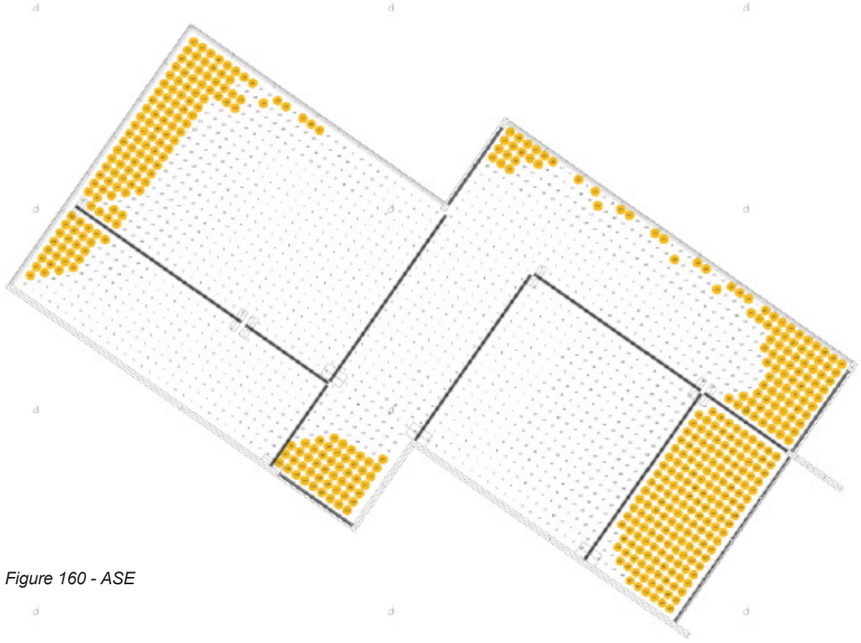
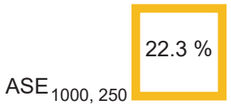
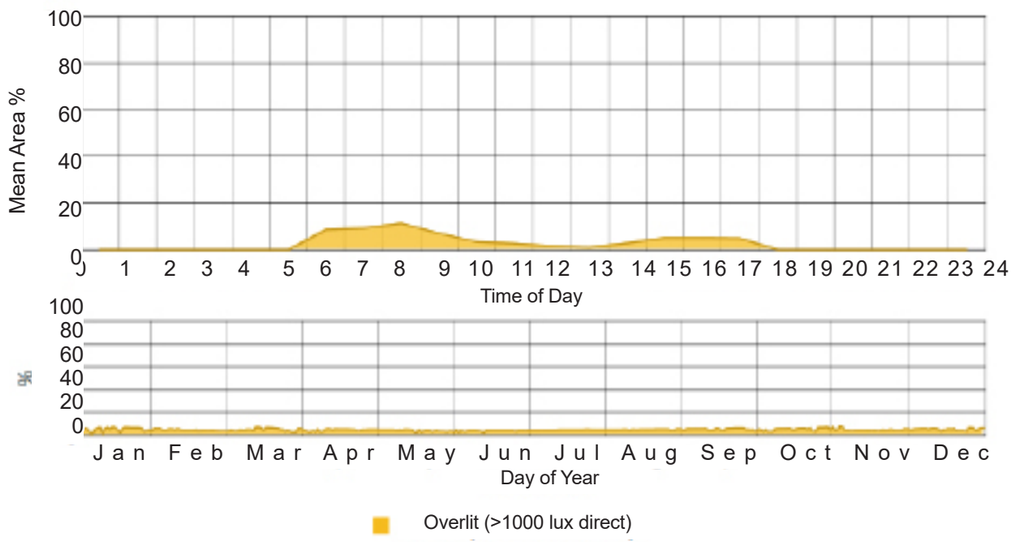


Figure 160 - ASE





Graph 13 - Annual Solar Exposure

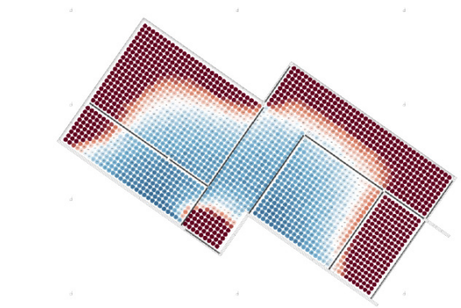


Figure 161 - Illuminance

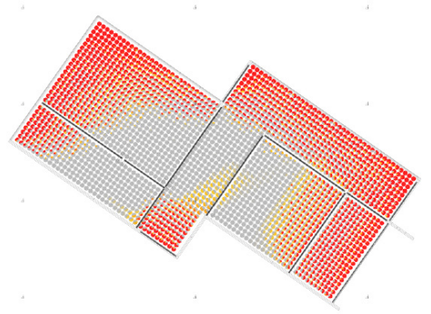
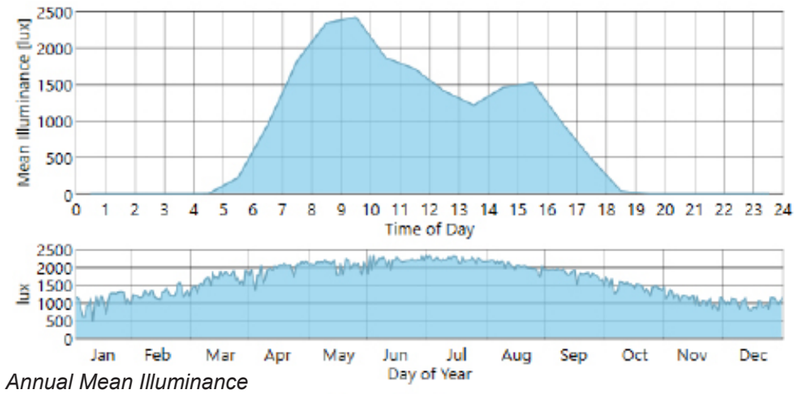
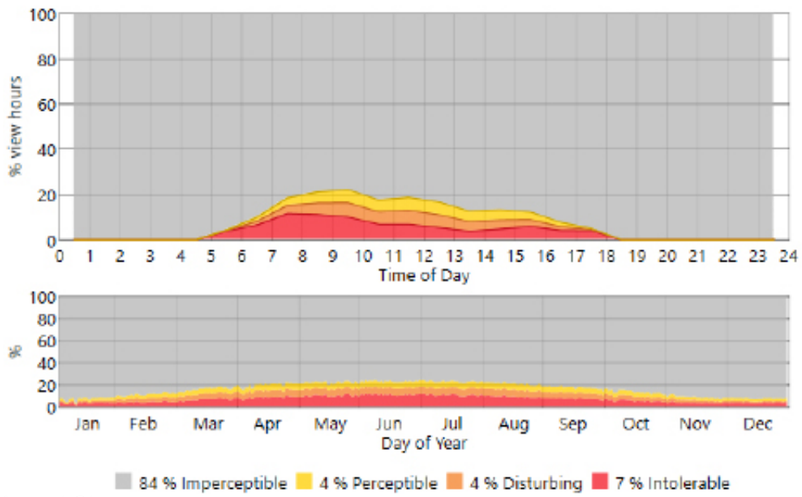


Figure 162 - Glare

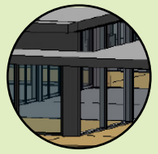


Graph 14 - Annual Mean Illuminance



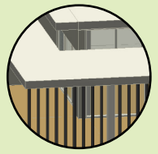
Graph 15 - Annual Glare

OPTION 1 - RESILIENCE HUB



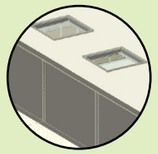
Horizontal Shading

Y



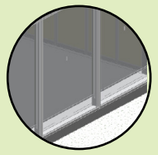
Vertical Shading

N



Skylights

N



Internal Shading

N

Occupancy

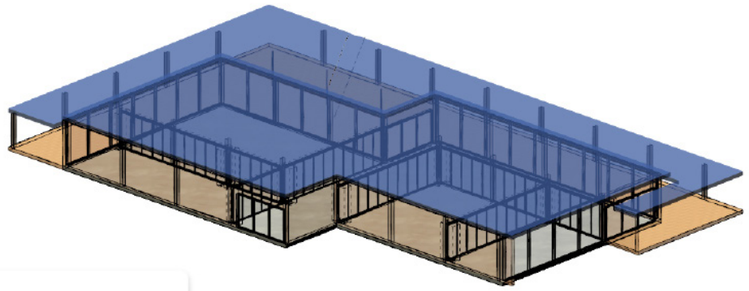
8 AM-6 PM DST

3 Credits

77.5% sDA

13.2% ASE

1119 avg. lux



Visualization of the building and set parameters.

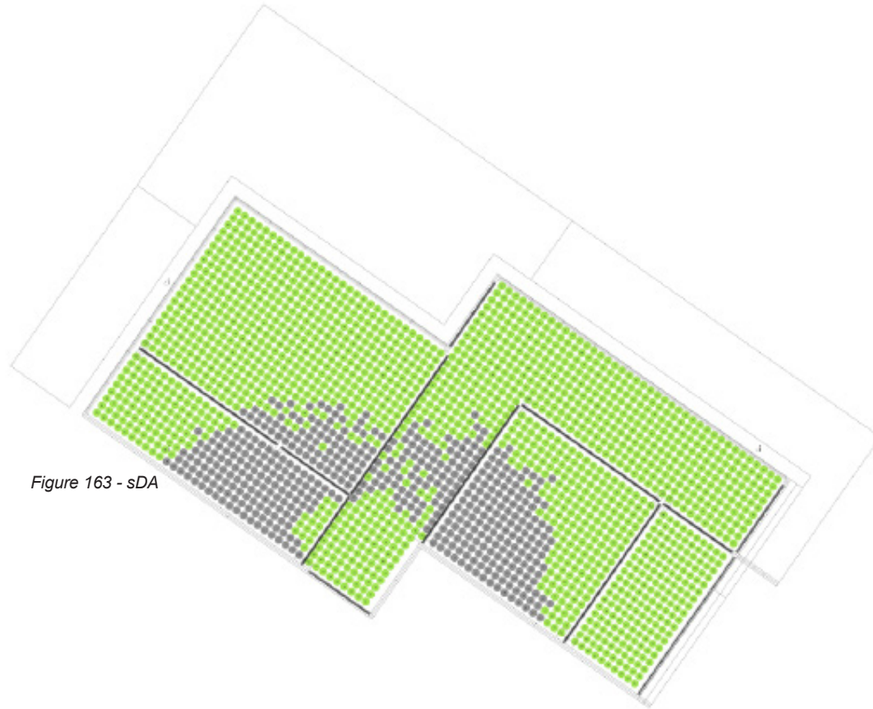
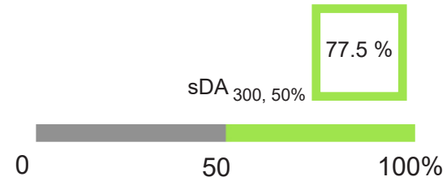
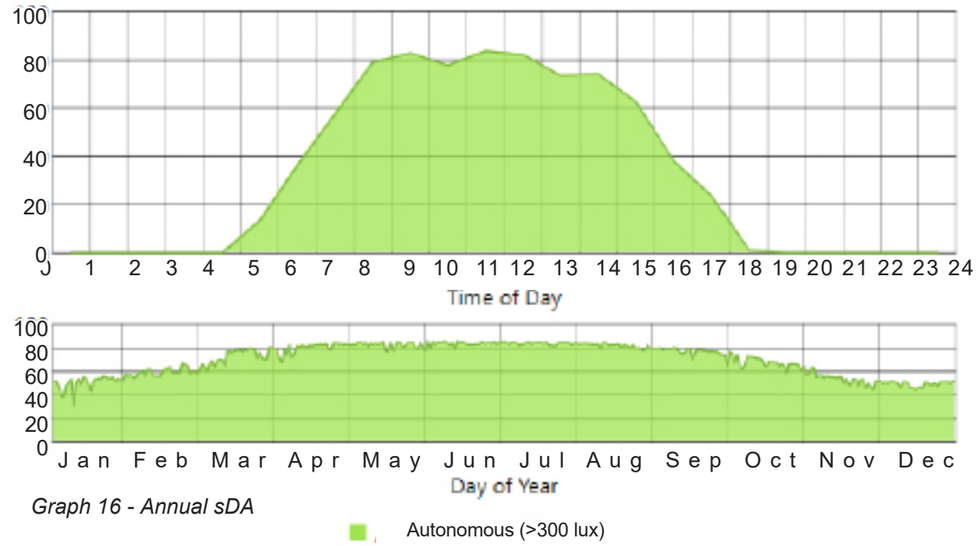


Figure 163 - sDA



OPTION1 - RESILIENCE HUB

Modifications for running the analysis include the addition of horizontal shading elements. A reduction in sDA to 77.5% from the baseline of 92.2% is achieved. The ASE has also considerably reduced to 13.2% from over 22.3% as analyzed in the baseline case. A substantial reduction in illuminace, though still quite high is observed. The glare , sDG rather is now about 18.1%.



Graph 16 - Annual sDA

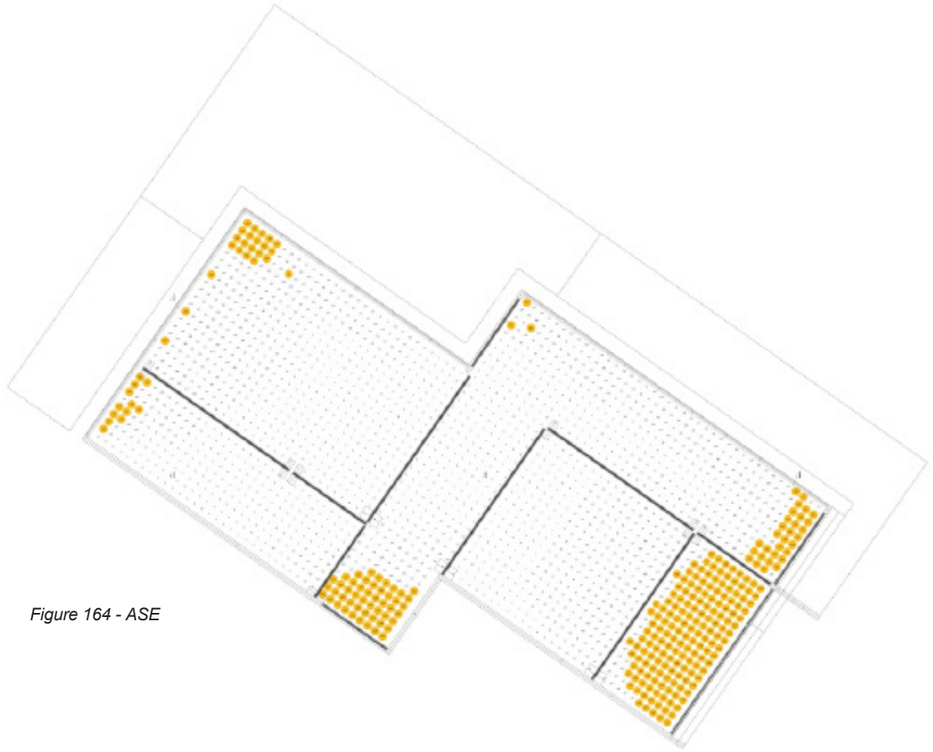


Figure 164 - ASE

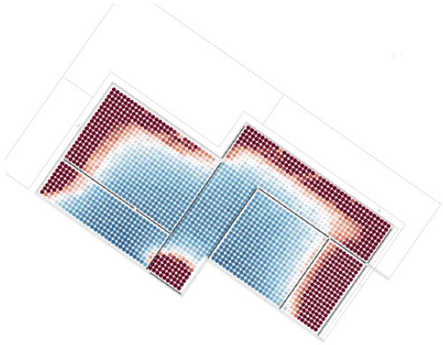


Figure 165 - Illuminance

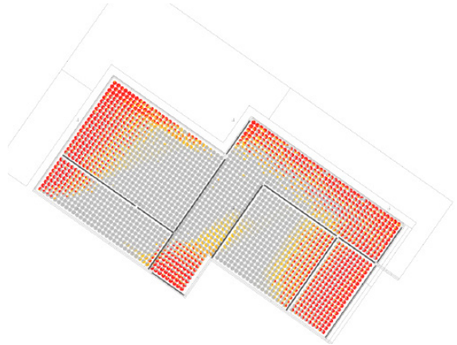
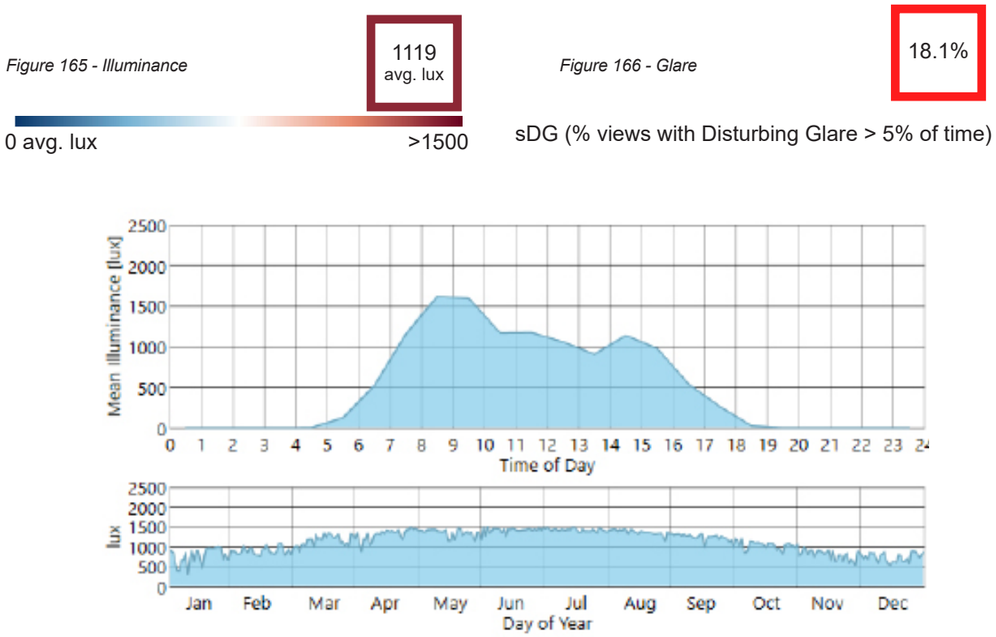
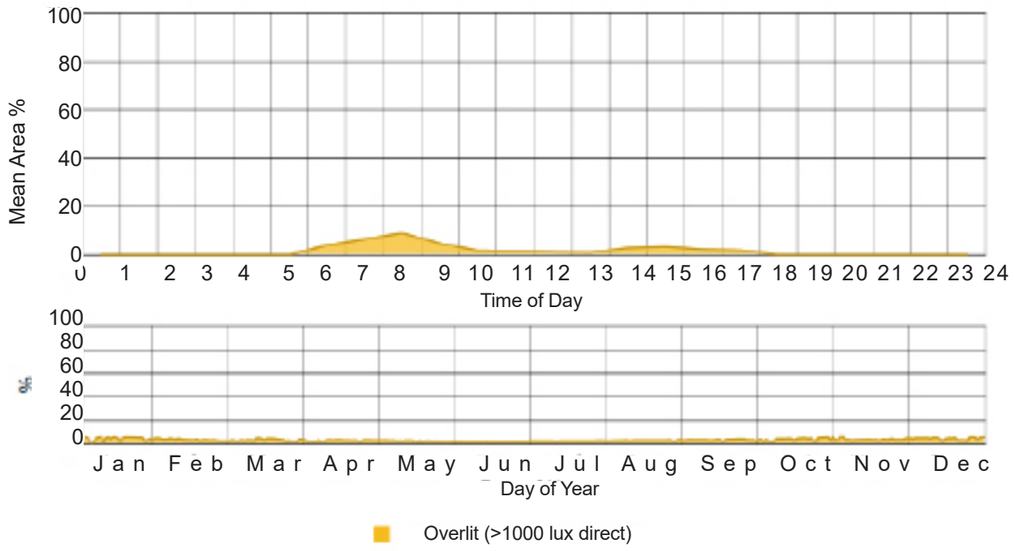


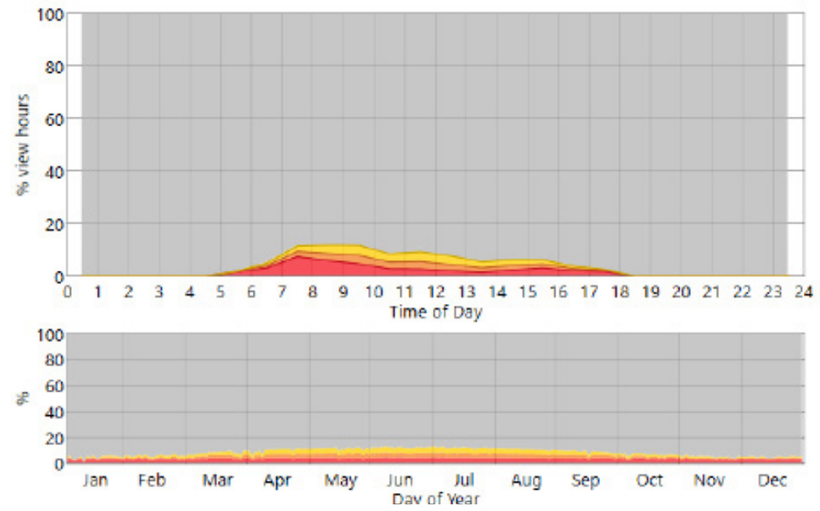
Figure 166 - Glare



Graph 19 - Annual Mean Illuminance

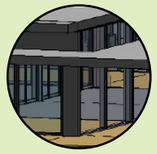


Graph 17 - Annual Solar Exposure



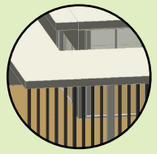
Graph 18 - Annual Glare

OPTION 2 - RESILIENCE HUB



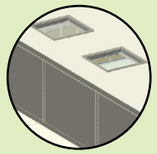
Horizontal Shading

Y



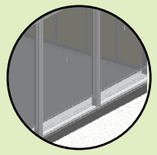
Vertical Shading

Y



Skylights

N



Internal Shading

Y

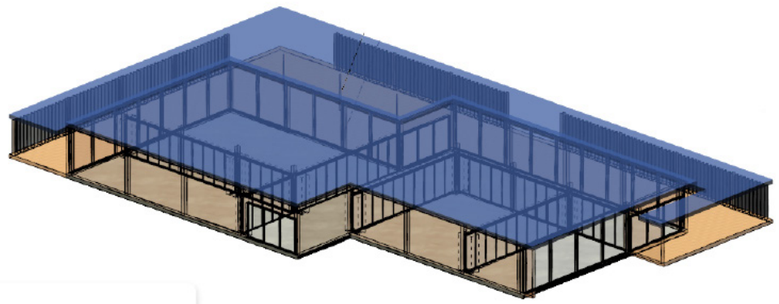
Occupancy
8 AM-6 PM DST

2 Credits

69.3% sDA

13.2% ASE

1055 avg. lux



Visualization of the building and set parameters.

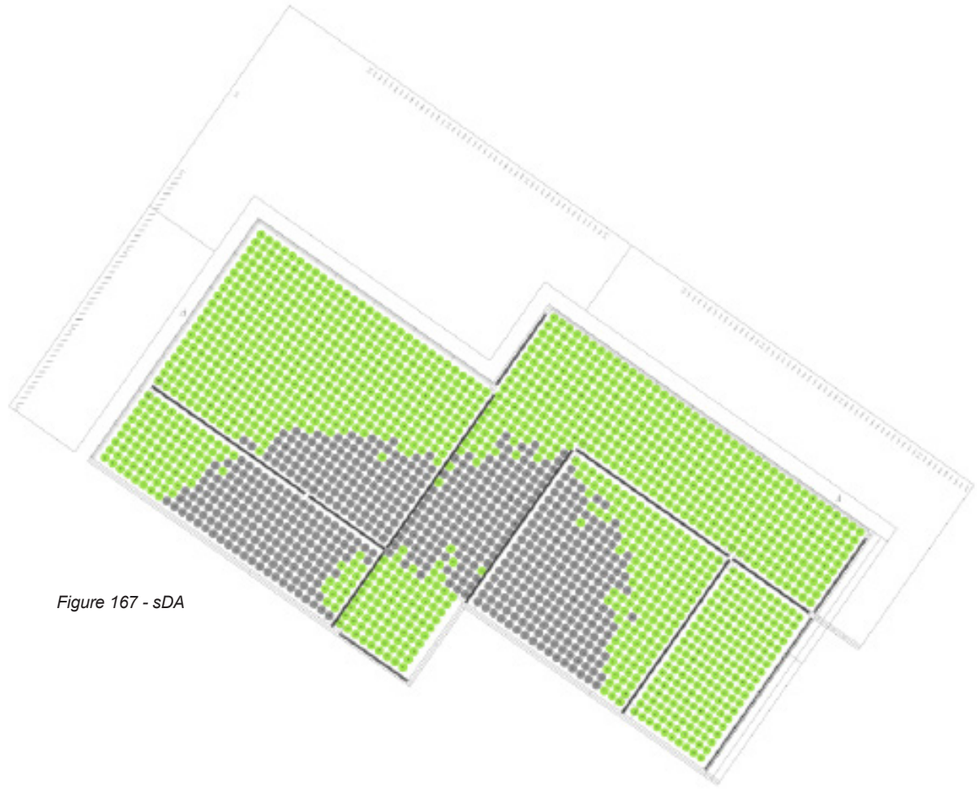
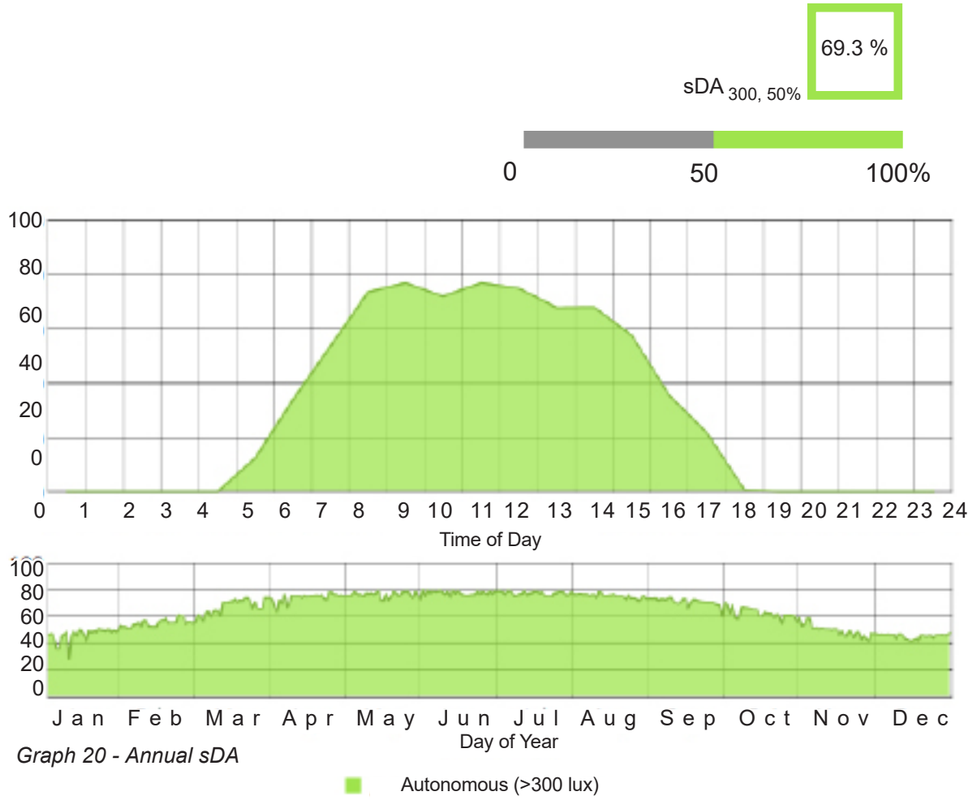


Figure 167 - sDA

OPTION 2 - RESILIENCE HUB

Modifications for running the analysis include the addition of vertical shading elements coupled with the horzontal shading. A reduction in sDA to 69.3% from 77.5% in the previous case is achieved. The ASE remains at 13.2% as in option 1 but is considerably decreased as 22.3% was analyzed in the baseline case. A slight reduction in illuminace observed and the daylight factor showcases a value of 2.1%. The glare now able to be regulated by the dynamic vertical shading system is brought down to 12.2%.

SELECTED OPTIONEERING CASE



Graph 20 - Annual sDA

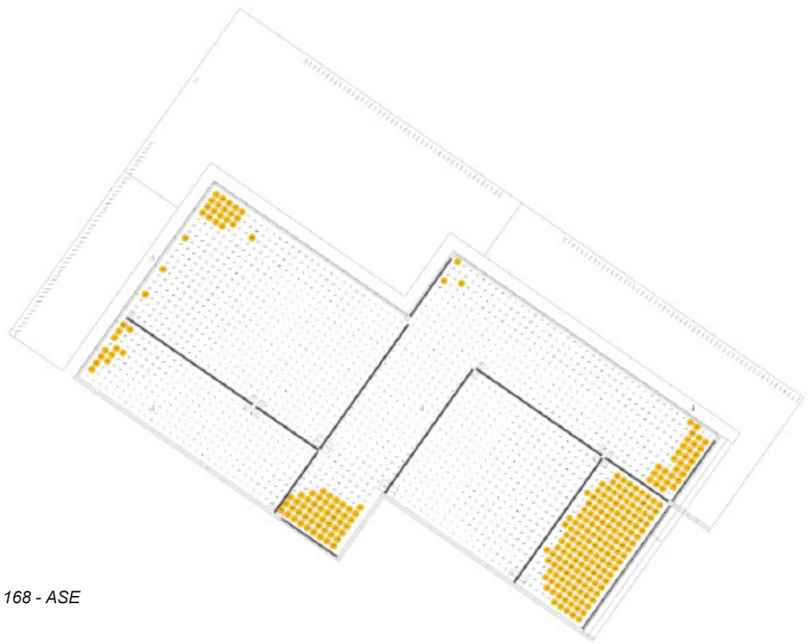
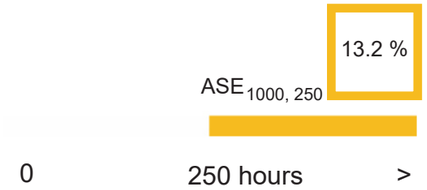
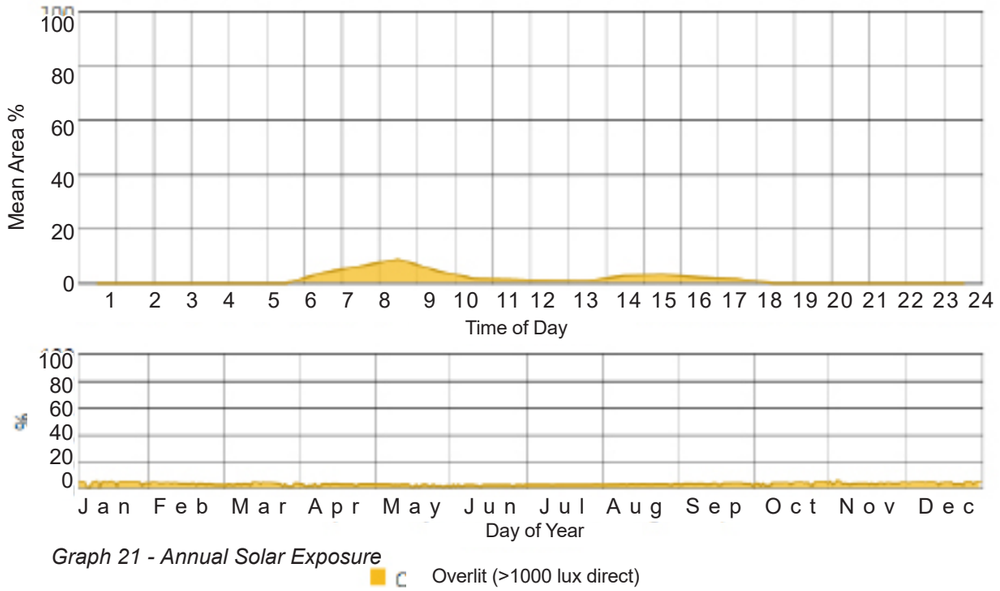


Figure 168 - ASE





Graph 21 - Annual Solar Exposure

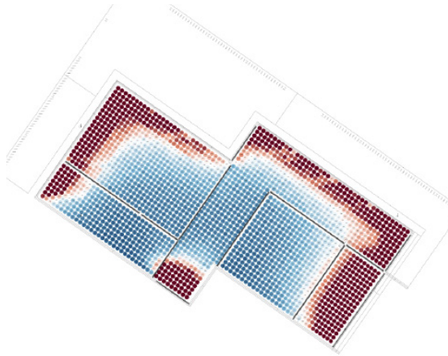


Figure 169 - Illuminance

1055
avg. lux

0 avg. lux >1500

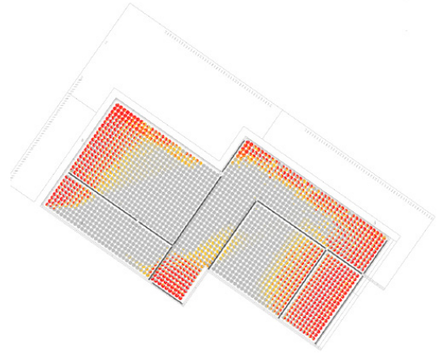
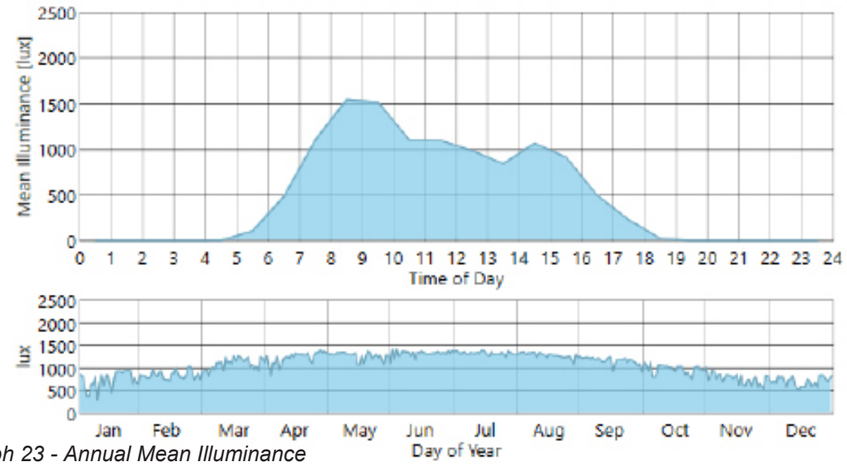


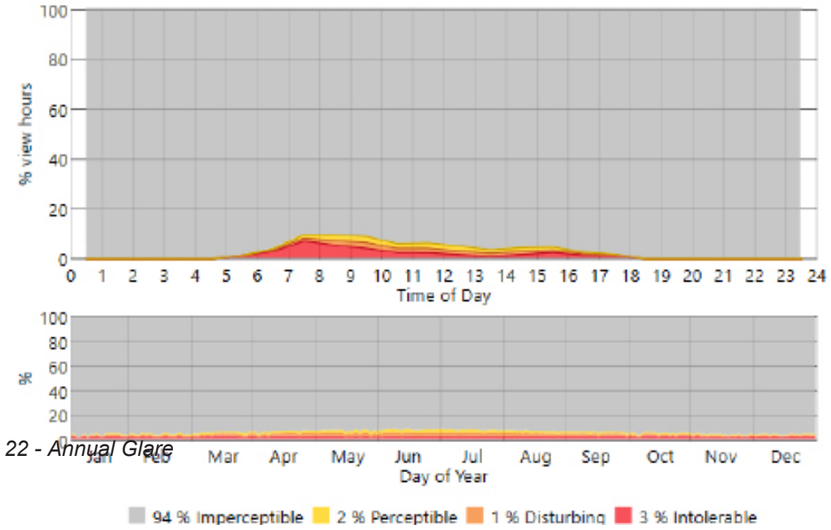
Figure 170 - Glare

12.2%

sDG (% views with Disturbing Glare > 5% of time)

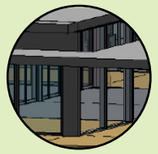


Graph 23 - Annual Mean Illuminance



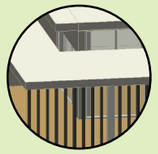
Graph 22 - Annual Glare

OPTION 3 - RESILIENCE HUB



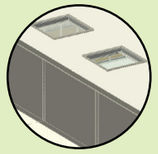
Horizontal Shading

Y



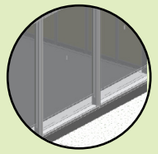
Vertical Shading

Y



Skylights

Y



Internal Shading

N

Occupancy

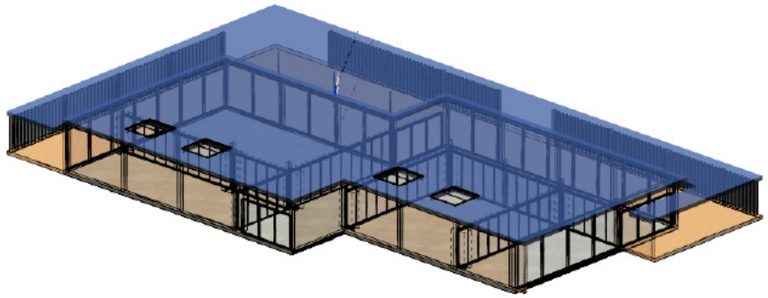
8 AM-6 PM DST

3 Credits

100.0% sDA

26.3% ASE

1730 avg. lux



Visualization of the building and set parameters.

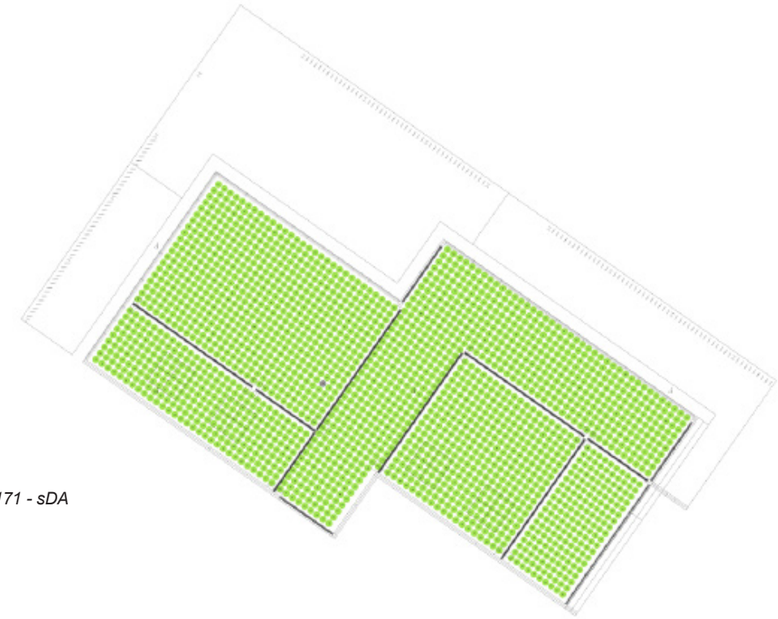
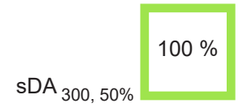
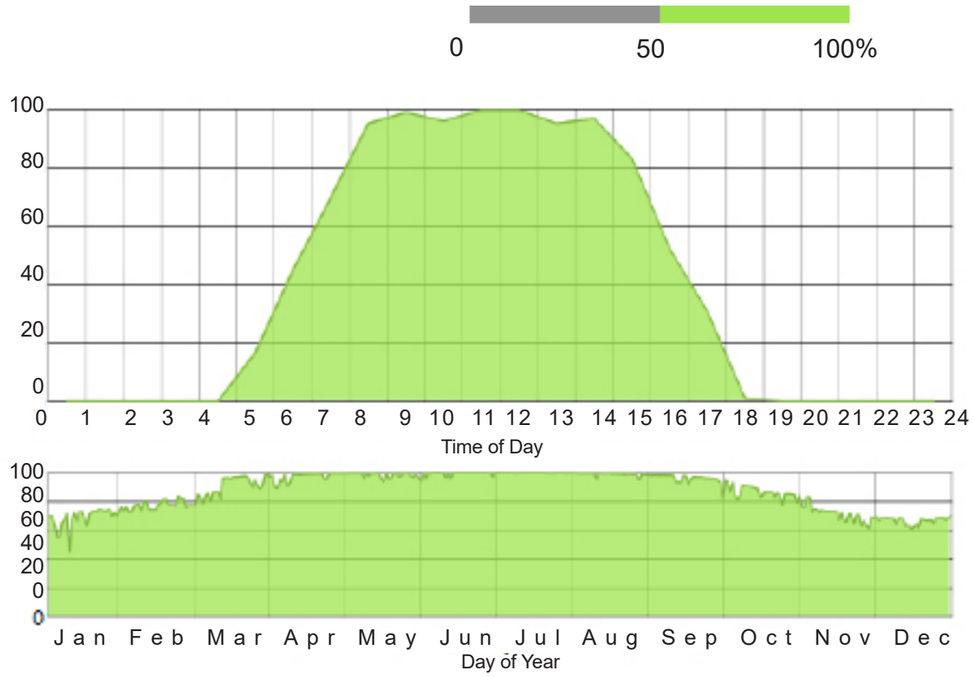


Figure 171 - sDA



OPTION 3 - RESILIENCE HUB

Modifications for running the analysis over option 2 include the addition of skylights as shown in the above visualization inclusing the vertical shading elements coupled with the horzontal shading. The results were quite surprising as an increase in sDA to 100% from 69.3% in the previous case is achieved. The ASE has risen to 26.3% from 13.2% as in option 1 and 2 and surpassed the baseline ASE of 22.3% . A significant increase in illuminace annualy for about 1730 lux is observed. The glare now also increases due to the addition of the skylights to about 18% . This drove us back into selecting Option 2 as the prefered model.



Graph 24 - Annual sDA

Autonomous (>300 lux)

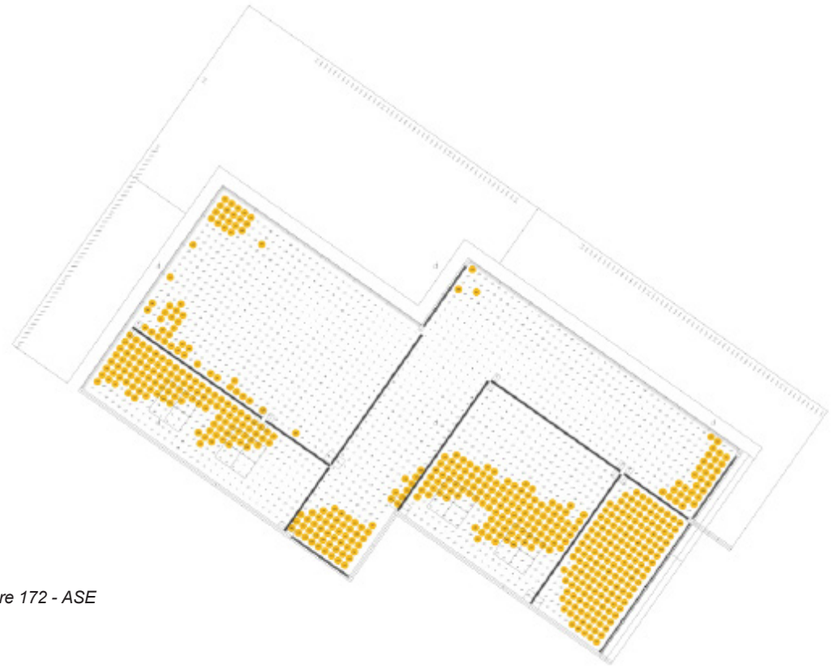
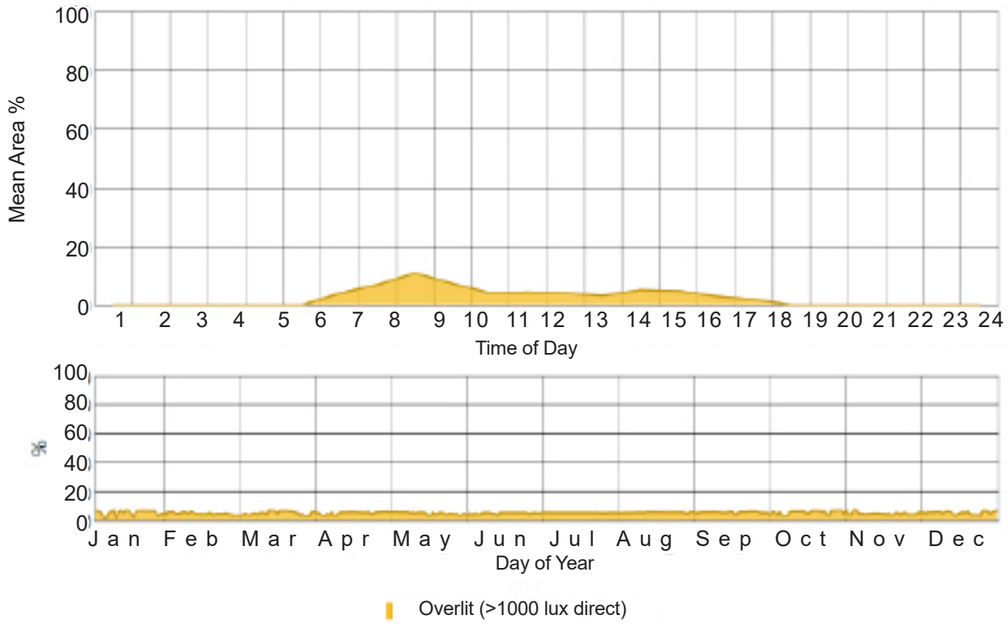


Figure 172 - ASE

$ASE_{1000,\ 250}$ 26.3 %

0 250 hours >



Graph 25 - Annual Solar Exposure

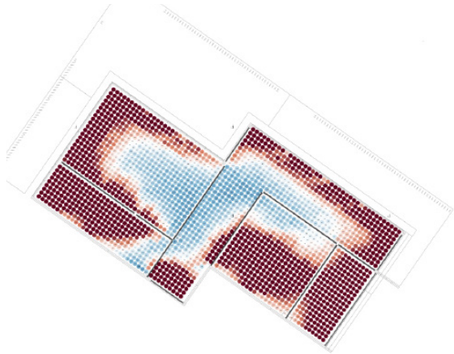


Figure 173 - Illuminance

1730
avg. lux

0 avg. lux >1500

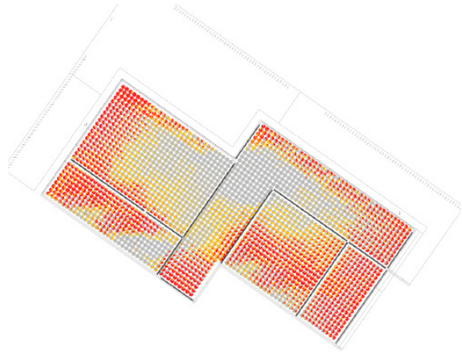
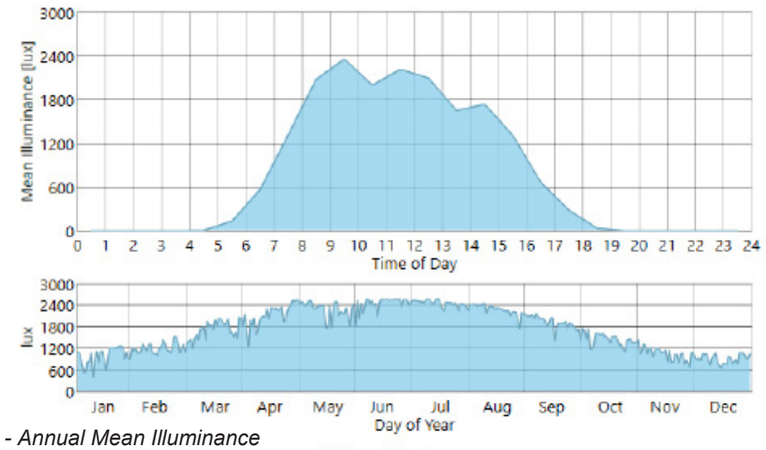


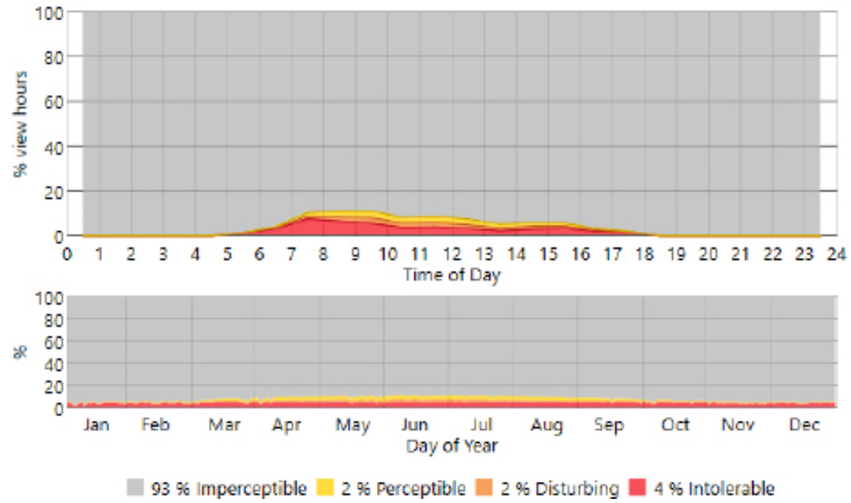
Figure 174 - Glare

17.9%

sDG (% views with Disturbing Glare > 5% of time)



Graph 27 - Annual Mean Illuminance



Graph 26 - Annual Glare

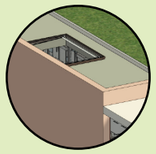
BASE CASE- COMMUNITY HUB

Horizontal Shading

N

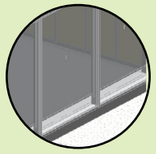
Vertical Shading

N



Skylights

N



Internal Shading

N

Occupancy

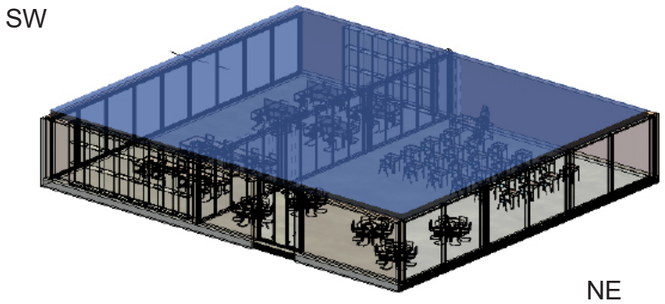
8 AM-6 PM DST

3 Credits

77.4% sDA

33.9% ASE

1598 avg. lux



Visualization of the building and set parameters.

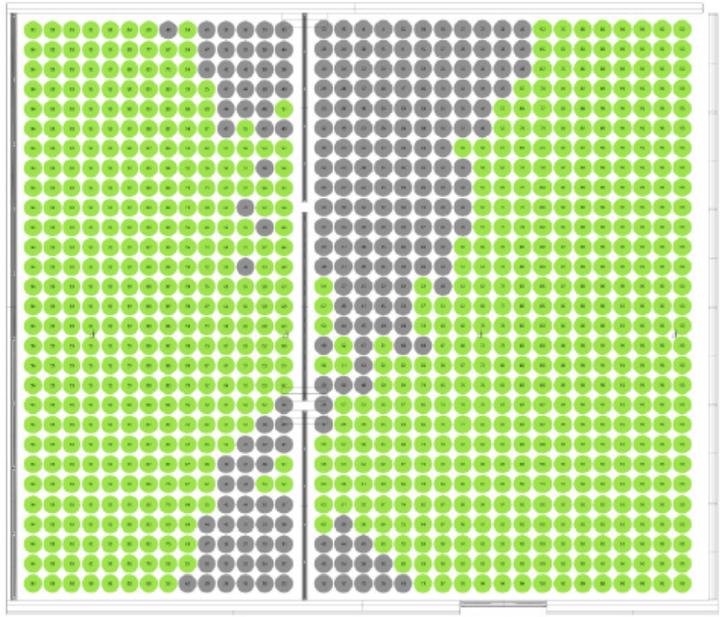
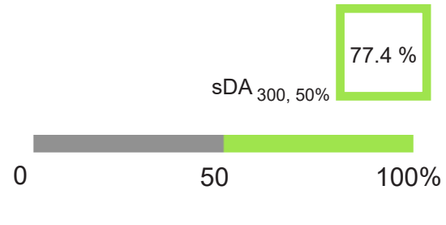
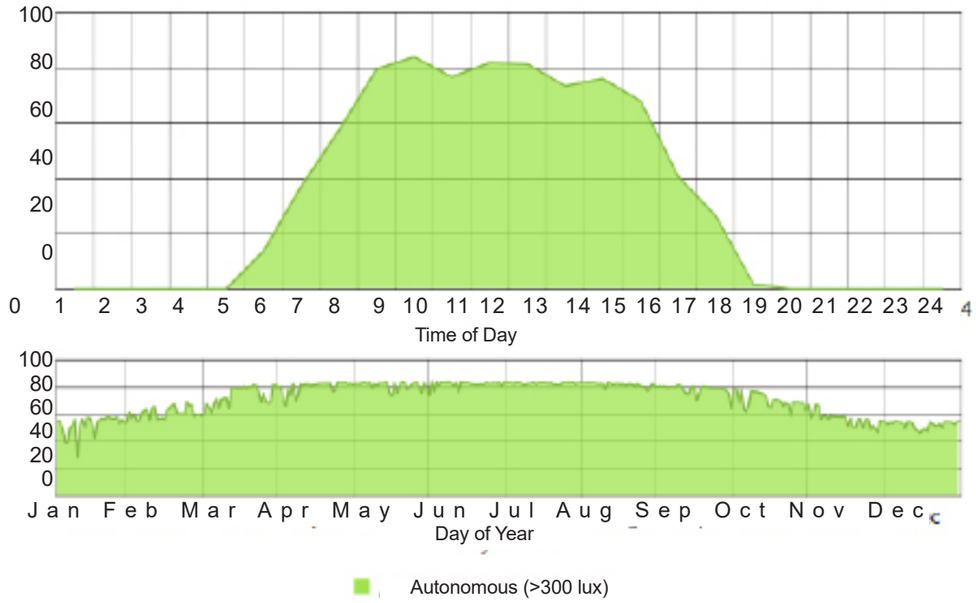


Figure 175 - sDA



BASE CASE - COMMUNITY HUB

The baseline case for the Community hub with no horizontal & vertical shading elements. A curtain wall system on the NE and SW facades. The analysis as expected was overlit with a high ASE of 33.9% with the average annual illuminance at 1598 lux. The sDA at 77.4% crosses the threshold of 75% to achieve a credit for the LEED v4.1certification but the high glare practically makes the interior of the hub an uncomfortable work place.



Graph 28 - Annual sDA

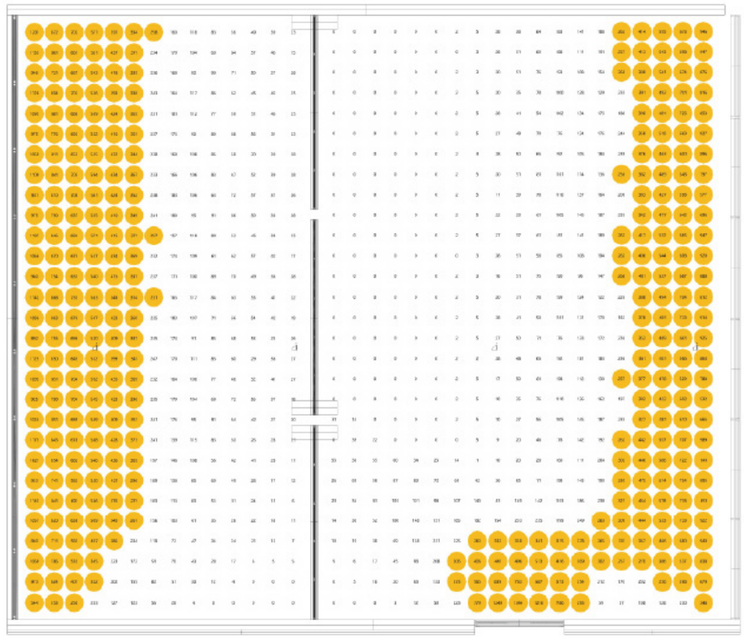
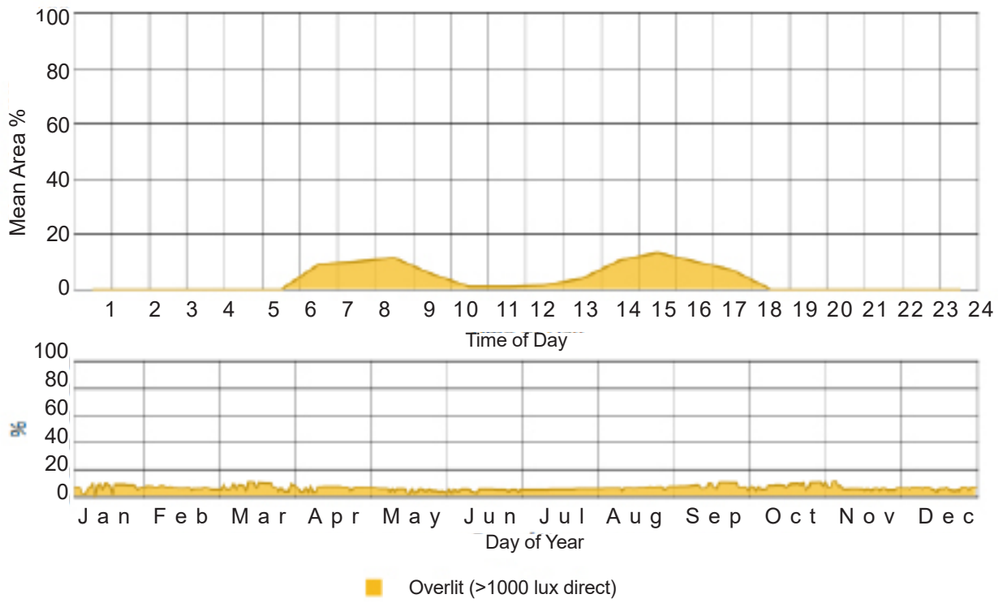


Figure 176 - ASE



Graph 29 - Annual Solar Exposure

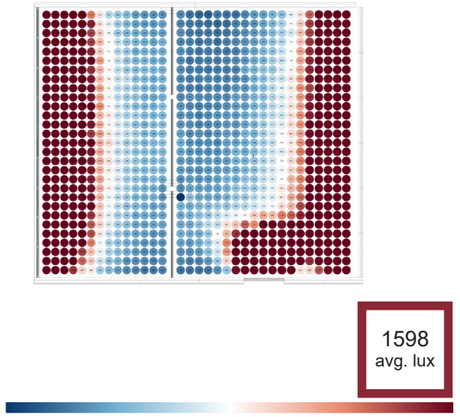


Figure 177 - Illuminance

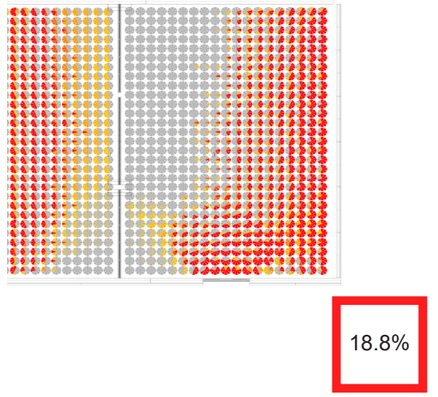
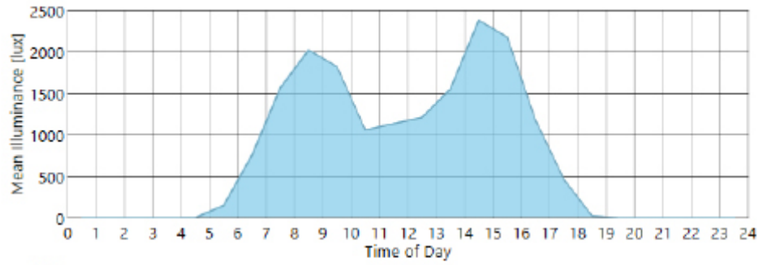
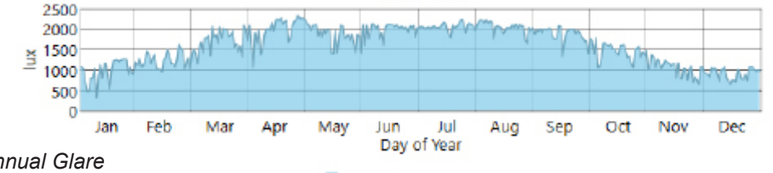
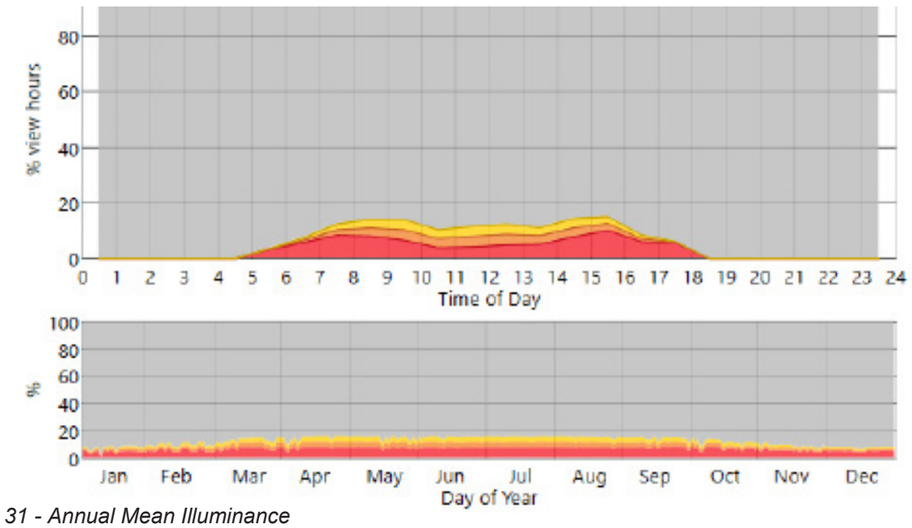


Figure 178 - Glare



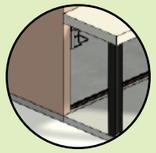


Graph 30 - Annual Glare



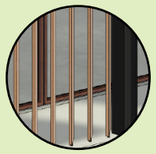
Graph 31 - Annual Mean Illuminance

OPTION 1- COMMUNITY HUB



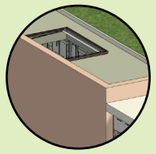
Horizontal Shading

Y



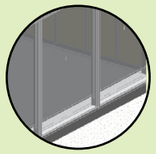
Vertical Shading

N



Skylights

N



Internal Shading

N

Occupancy

8 AM-6 PM DST

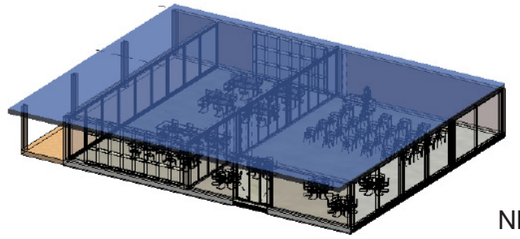
2 Credits

64.5% sDA

20.9% ASE

969 avg. lux

SW



NE

Visualization of the building and set parameters.

OPTION 1 - COMMUNITY HUB

The baseline case for the Community hub with no vertical shading elements. A curtain wall system on the NE and SW facades however now with a horizontally shading over hang roof on the SW facade to shield from the sun . The analysis reveals an ASE decreased to 20.9% from that of 33.9% as in the baseline with the average annual illuminance at 969 lux from 1598 lux. The sDA at 64.5% brought down from 77.4%.

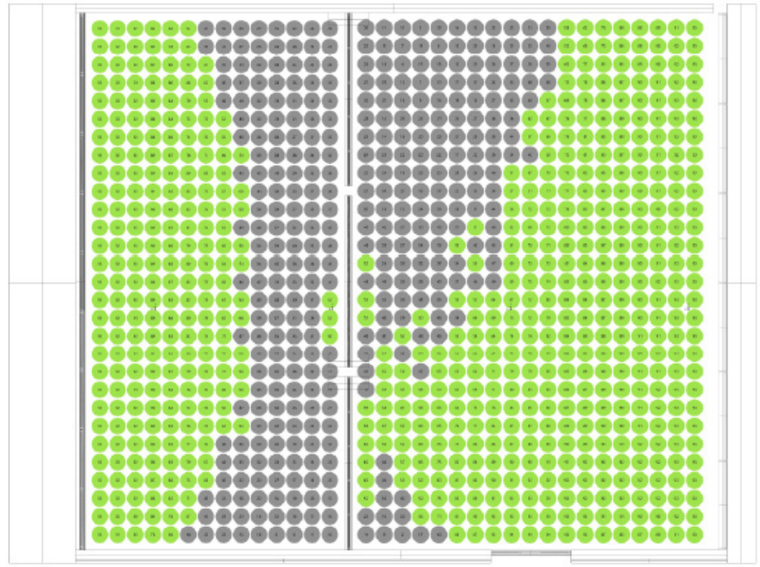
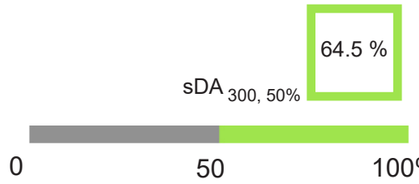
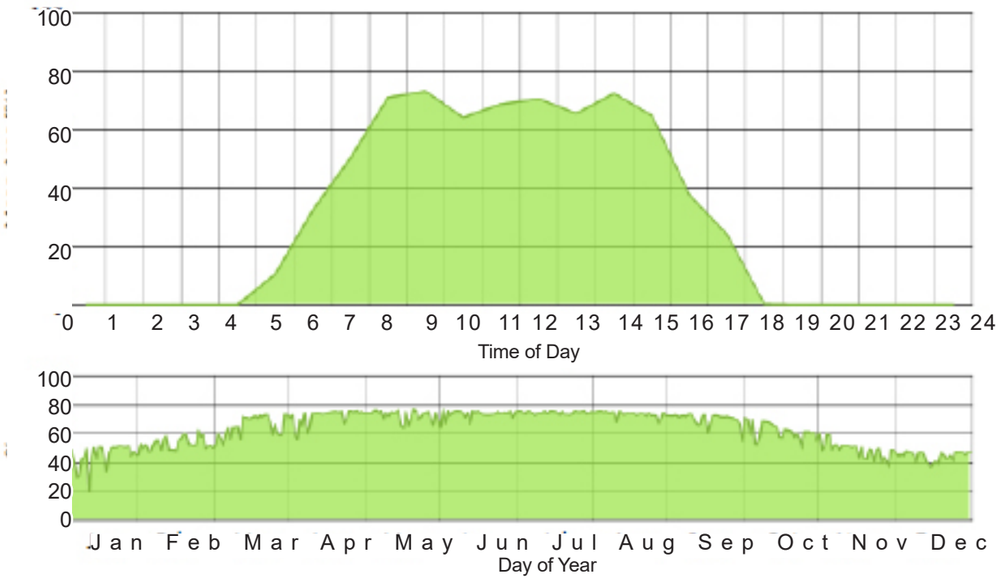


Figure 179 - sDA





Graph 32 - Annual sDA

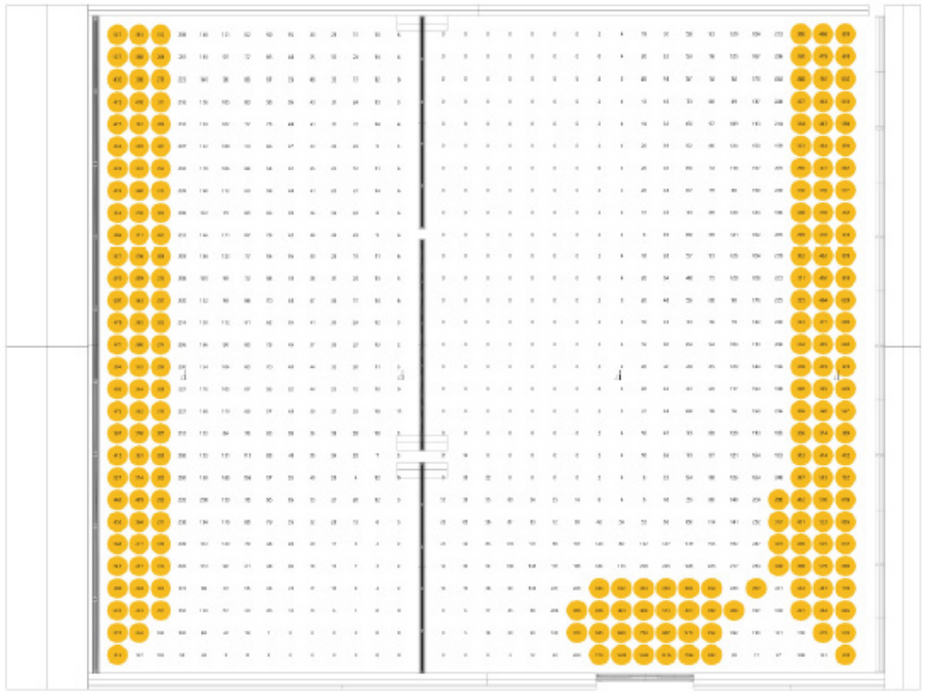
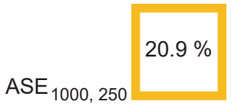


Figure 180 - ASE



Graph 33 - Annual Solar Exposure

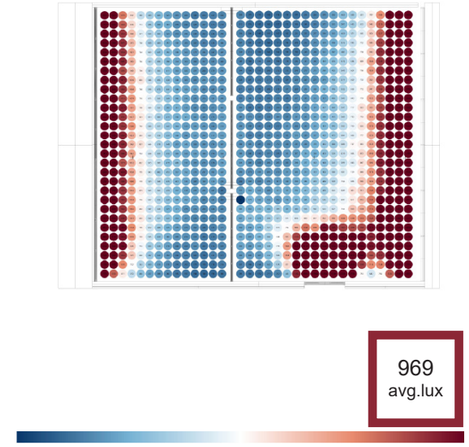


Figure 181 - Illuminance

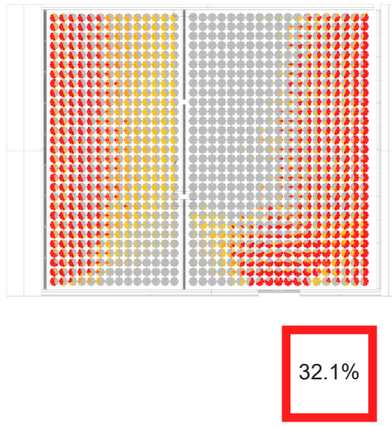
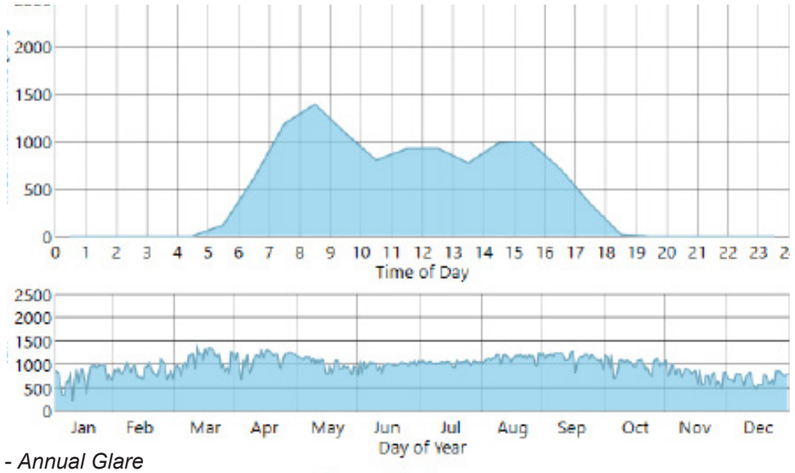
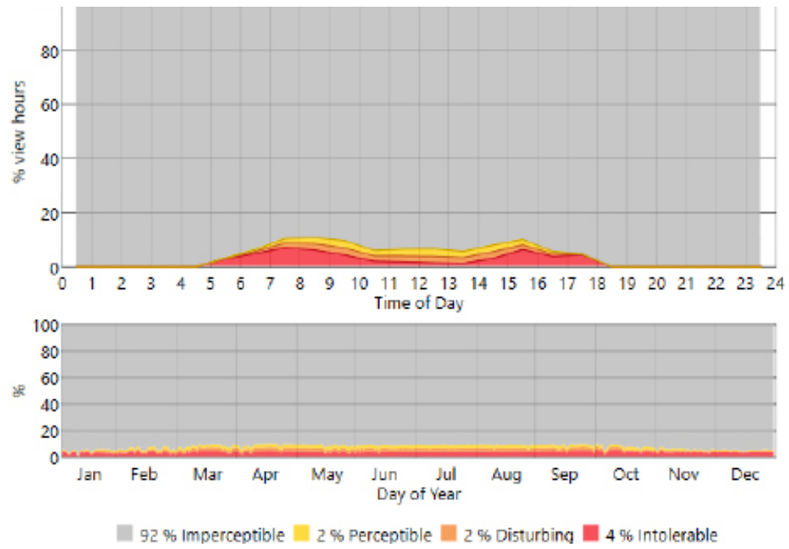


Figure 182 - Glare

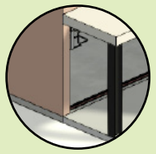


Graph 34 - Annual Glare



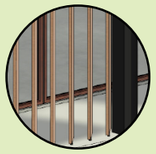
Graph 35 - Annual Mean Illuminance

OPTION 2- COMMUNITY HUB



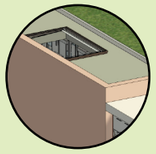
Horizontal Shading

Y



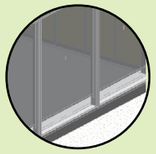
Vertical Shading

Y



Skylights

N



Internal Shading

N

Occupancy
8 AM-6 PM DST

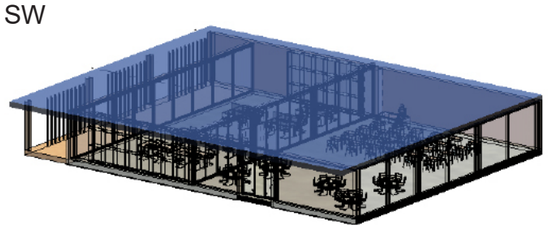
1 Credit

50.5% sDA

14.1% ASE

798 avg. lux

SW



NE

Visualization of the building and set parameters.

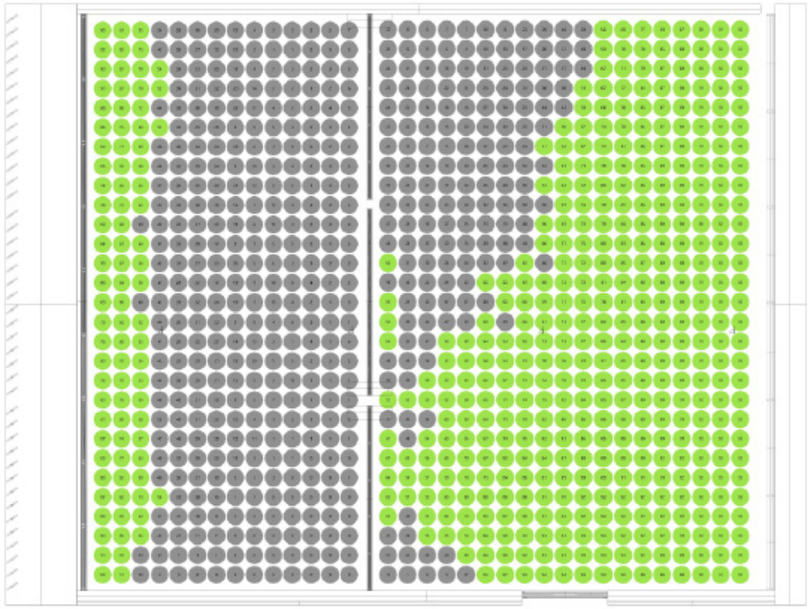
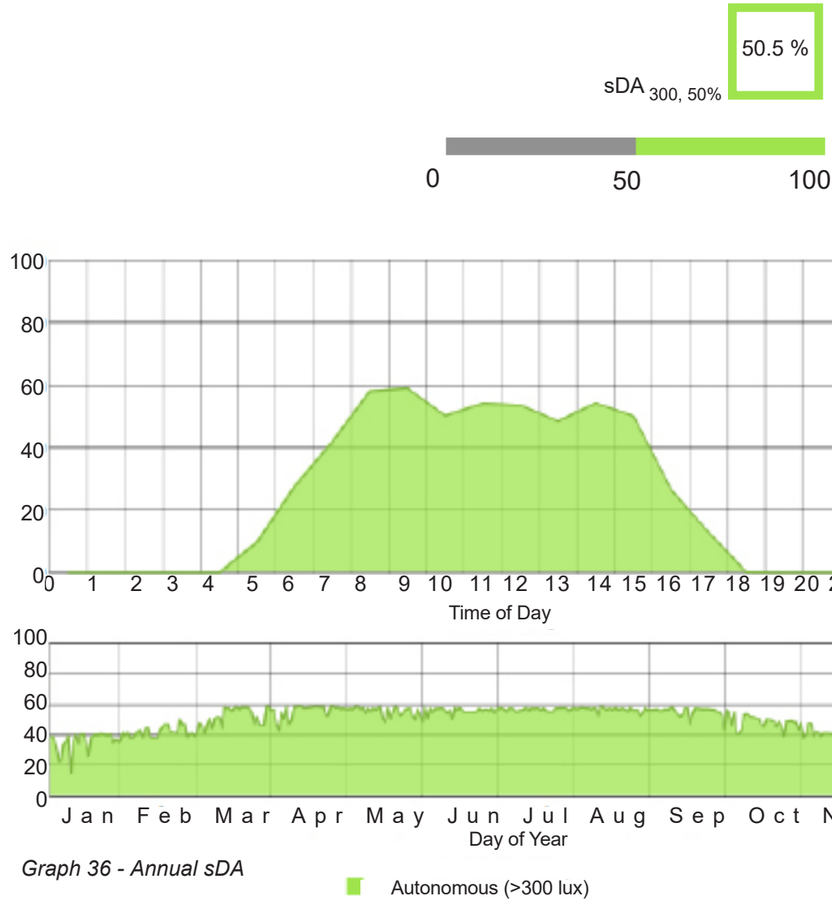


Figure 183 - sDA



Graph 36 - Annual sDA

OPTION 2 - COMMUNITY HUB

This iteration is modified over Option 1 with the addition of a dynamic vertical shading system coupled with the horizontal overhang roof as in the previous iteration.The curtain wall on the NE facade remains unchanged as we wished to provide a view to the visitors and occupants towards the intermodal hub for reasons of architecture and aesthetics but the area hardly improves its illuminance and tendsto be overlit . The analysis reveals an ASE decreased to 14.1% from that of 20.9% as in option 1 with the average annual illuminance at 798 lux from 969 lux in the previous iteration lux. The sDA sits at 50.5% decreased from 64.5% in option 1 and 77.4% in the baseline.

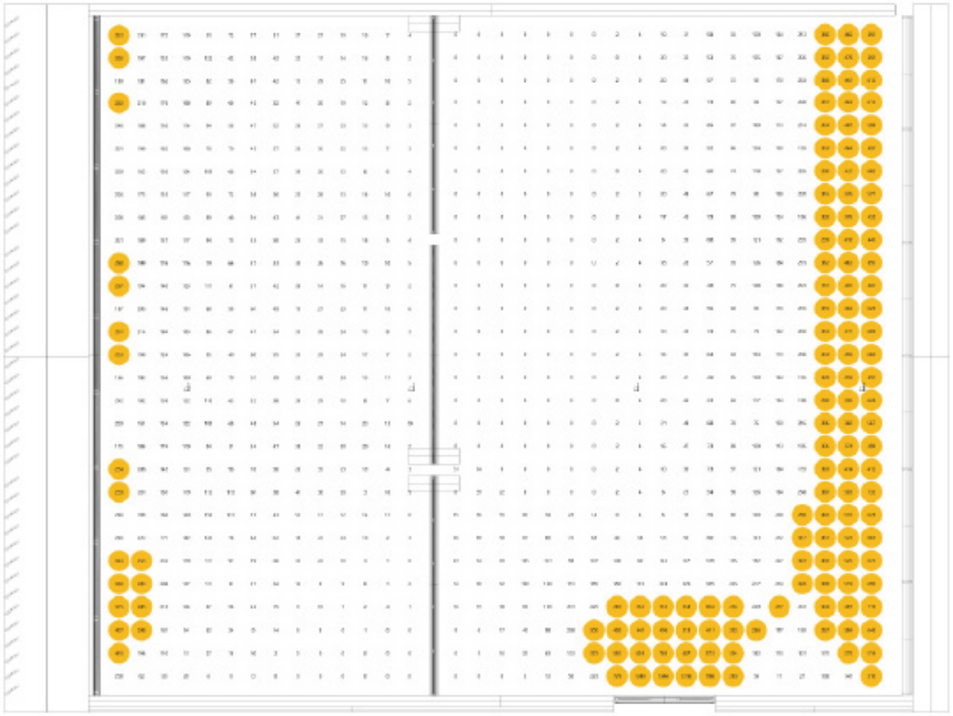
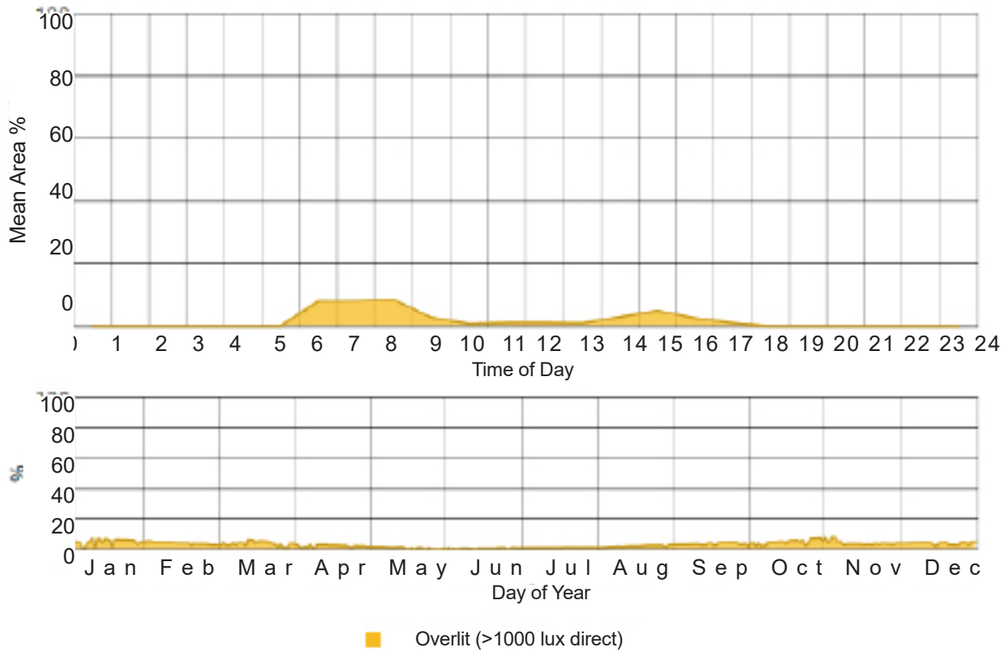


Figure 184 - ASE



Graph 37 - Annual Solar Exposure

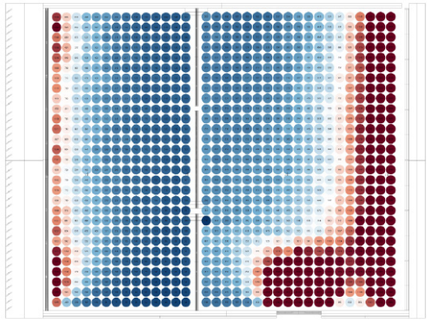
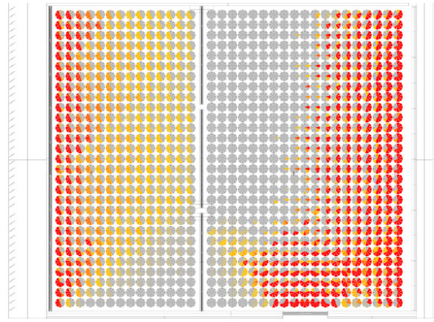
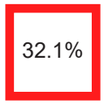


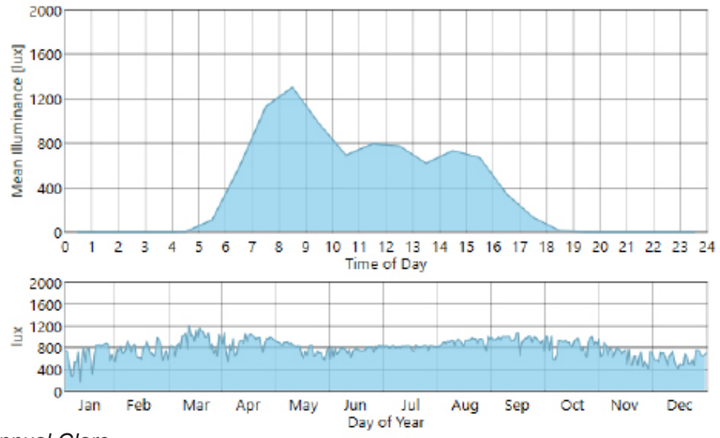
Figure 185 - Illuminance



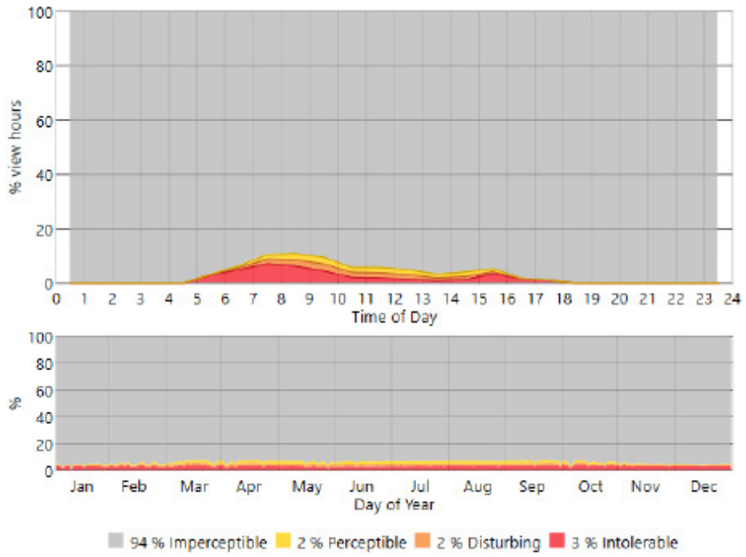


sDG (% views with Disturbing Glare > 5% of time)

Figure 186 - Glare

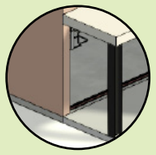


Graph 38 - Annual Glare



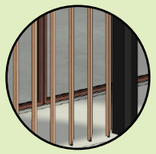
Graph 39 - Annual Mean Illuminance

OPTION 3- COMMUNITY HUB



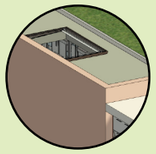
Horizontal Shading

Y



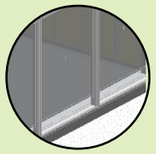
Vertical Shading

Y



Skylights

Y



Internal Shading

Y

Occupancy

8 AM-6 PM DST

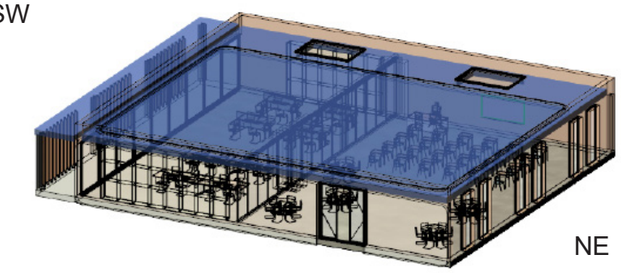
2 Credits

67.1% sDA

15.8% ASE

914 avg. lux

SW



NE

Visualization of the building and set parameters.

OPTION 3 - COMMUNITY HUB

This iteration is modified over Option 2 with a complete removal of the curtain wall system on the NE facade with the introduction of a wall with vertical and narrow windows. The addition of skylights was done in order to ensure ambient sDA levels were maintained . The analysis reveals an ASE of 15.8% from that of 20.9% as in option 1 with the average annual illuminance at 914 lux.. The sDA increased to 67.1% from 64.5% in option 1. Moreover the glare has now substantially reduced to have sDG value of about 8.5% being managed by the vertical shading system and the use of internal blinds on the windows and skylights.

SELECTED OPTIONEERING CASE

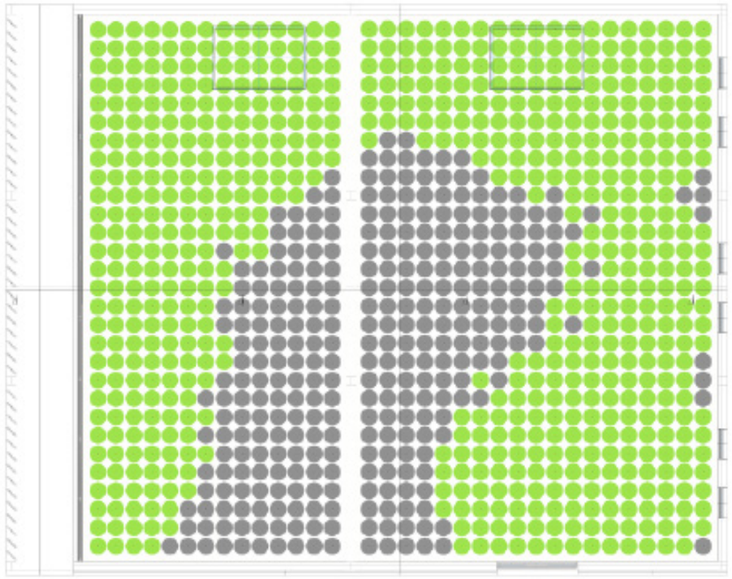
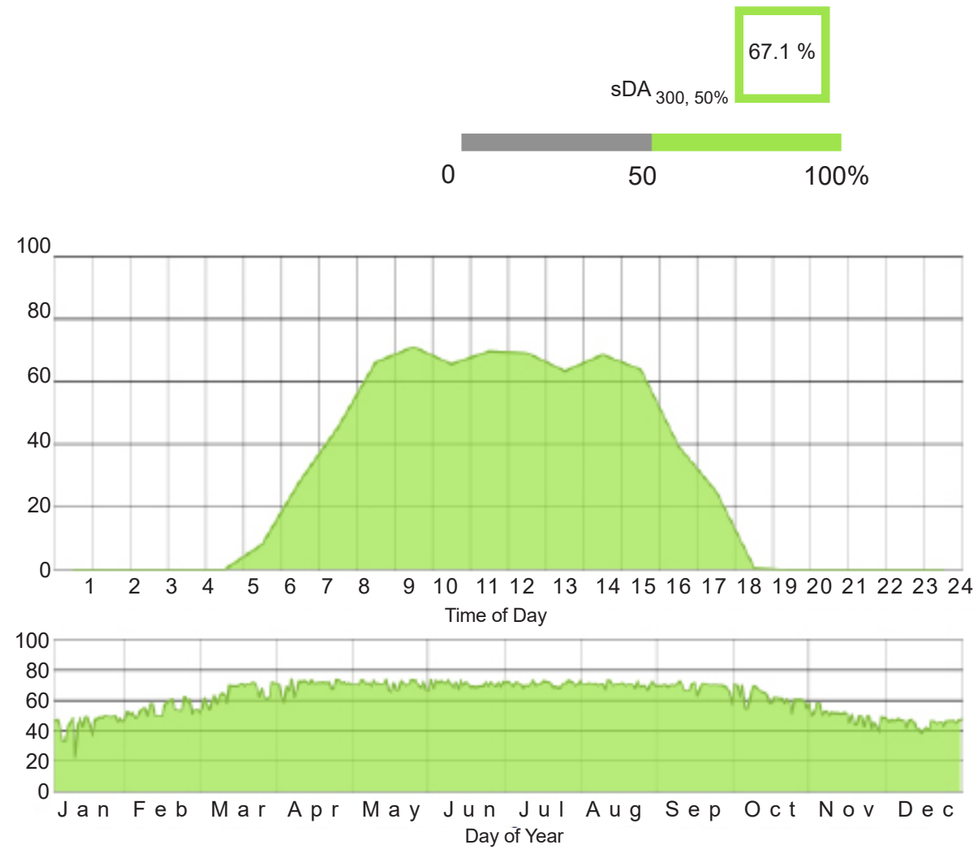


Figure 187 - sDA



Graph 40 - Annual sDA

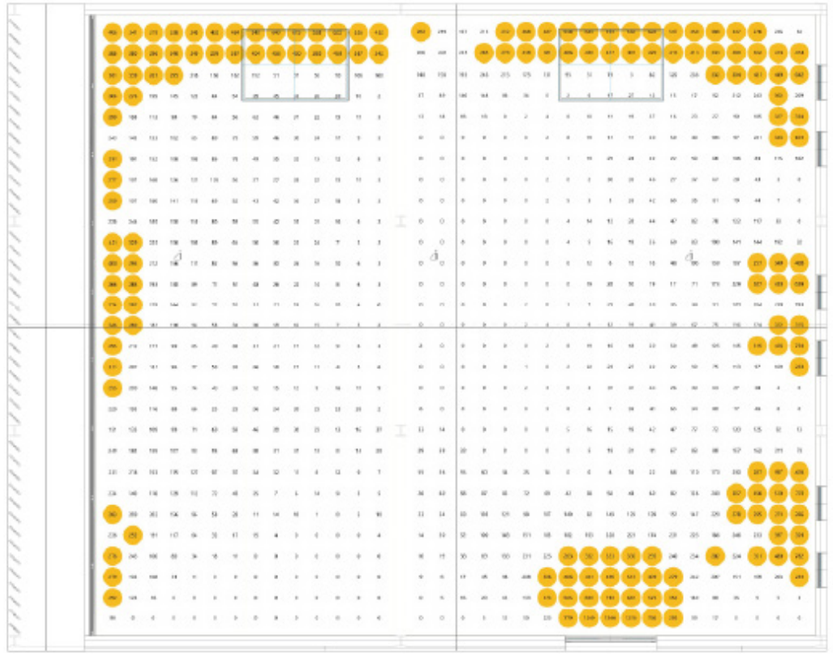
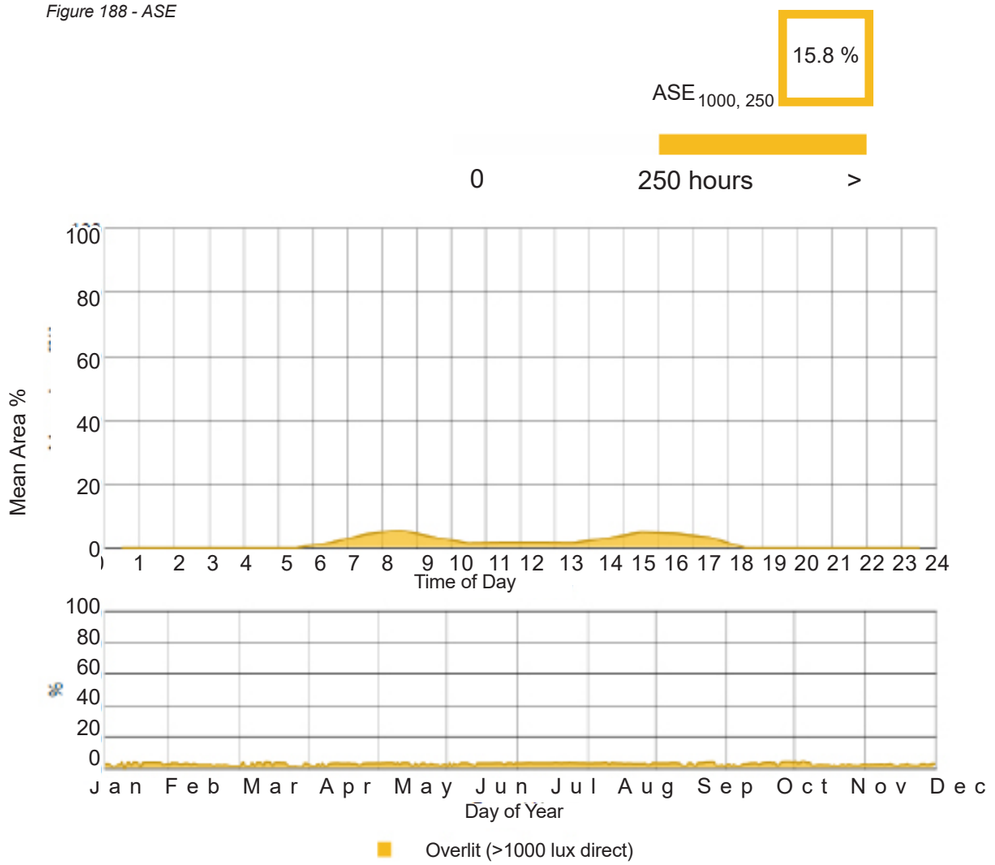
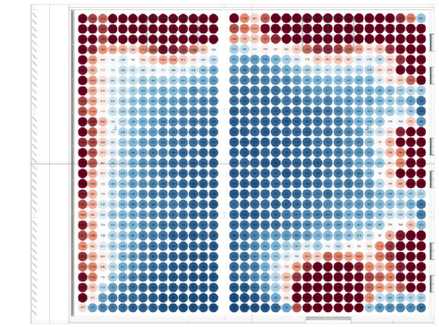


Figure 188 - ASE



Graph 41 - Annual Solar Exposure



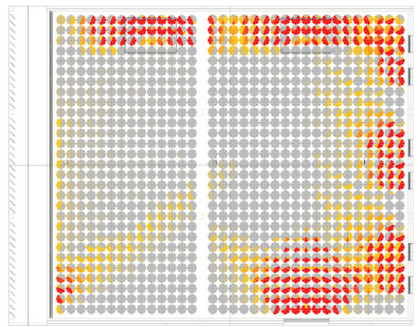
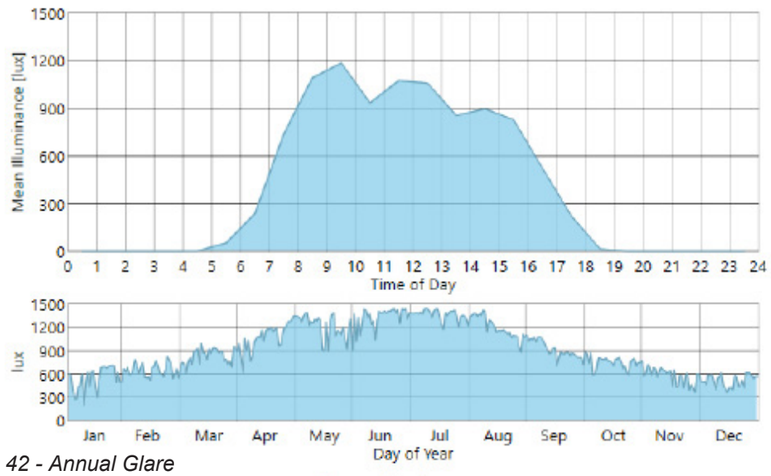


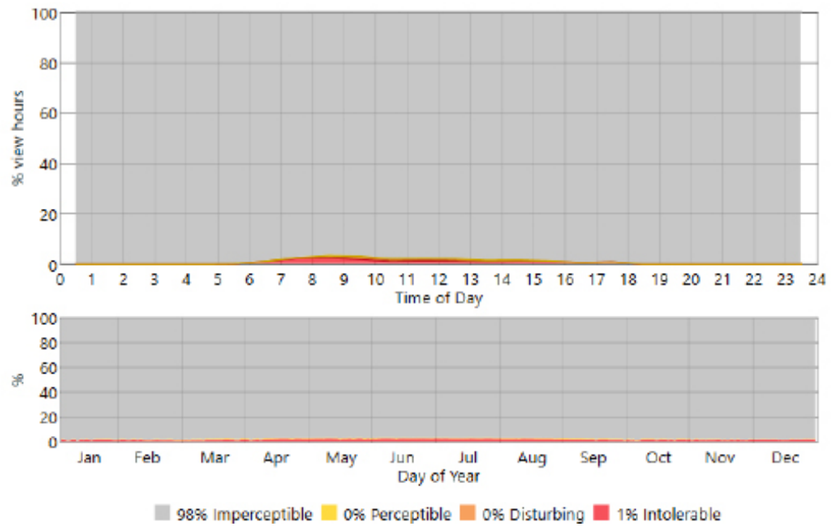
Figure 189 - Illuminance

sDG (% views with Disturbing Glare > 5% of time)

Figure 190 - Glare



Graph 42 - Annual Glare

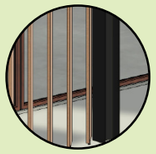


Graph 43 - Annual Mean Illuminance

BASE CASE - OFFICES

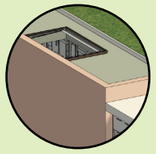
Horizontal Shading

N



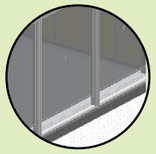
Vertical Shading

N



Skylights

N



Internal Shading

N

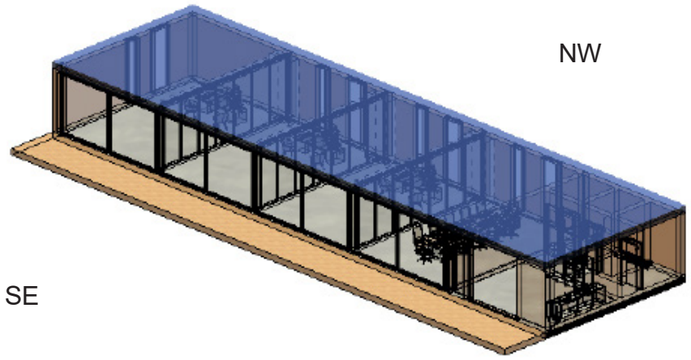
Occupancy
8 AM-6 PM DST

3 Credits

96.8% sDA

48.6% ASE

2875 avg. lux

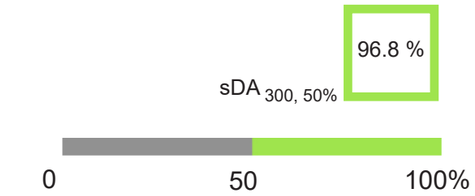


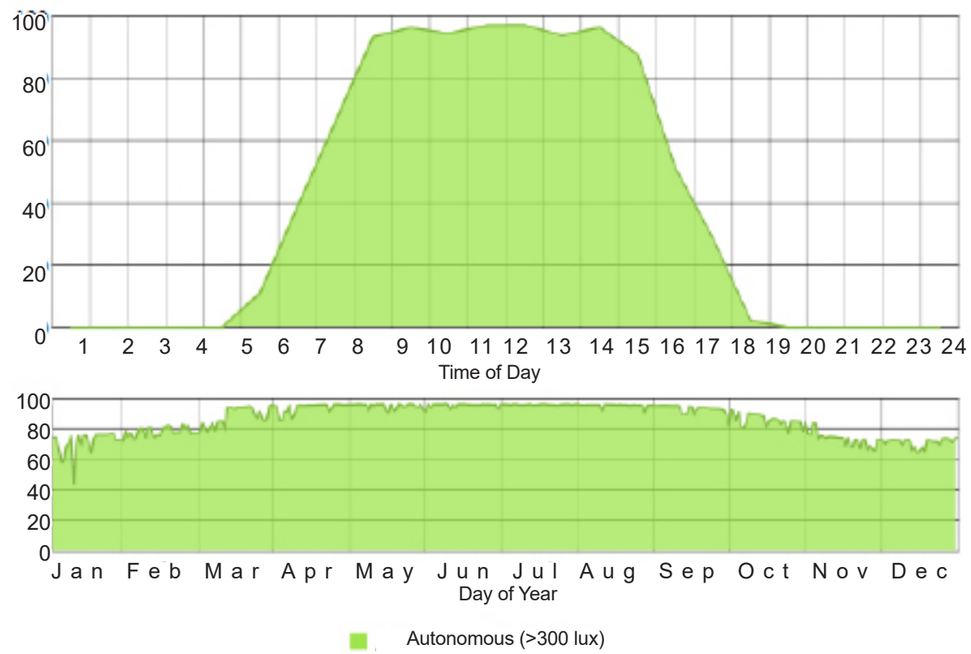
Visualization of the building and set parameters.

BASE CASE - OFFICES

The baseline case for the office building with no horizontal & vertical shading elements. A curtain wall system on the SE to provide connectivity with the courtyard and the resilience and community hubs. A blind facade with vertical and narrow windows on the NW.The analysis as expected was overlit with a high ASE of 48.6% with the average annual illuminance at 2876 lux. The sDA at 96.8% crosses the threshold of 75% to achieve a credit for the LEED v4.1certification but the high glare practically makes the interior of the office an uncomfortable working place. The baseline showcases extreme values.

Figure 191 - sDA





Graph 44 - Annual sDA

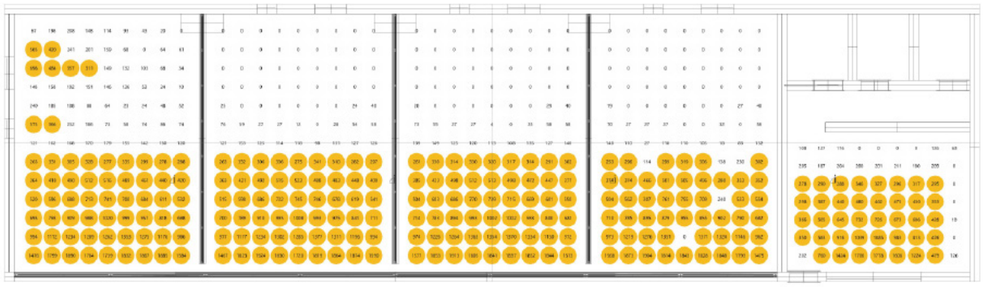


Figure 192 - ASE

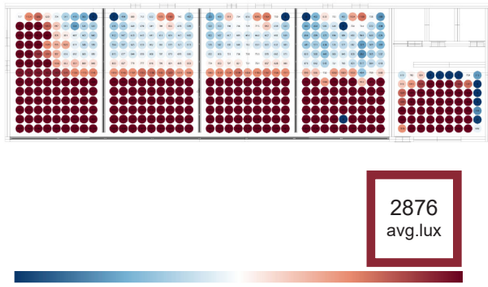


Figure 193 - Illuminance

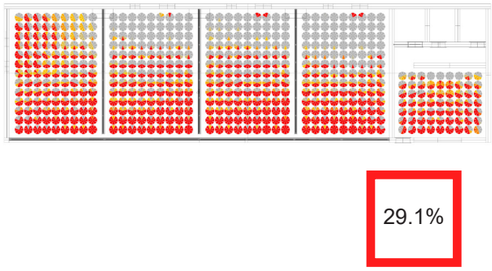
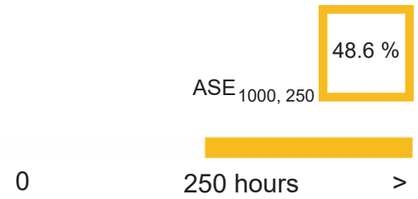
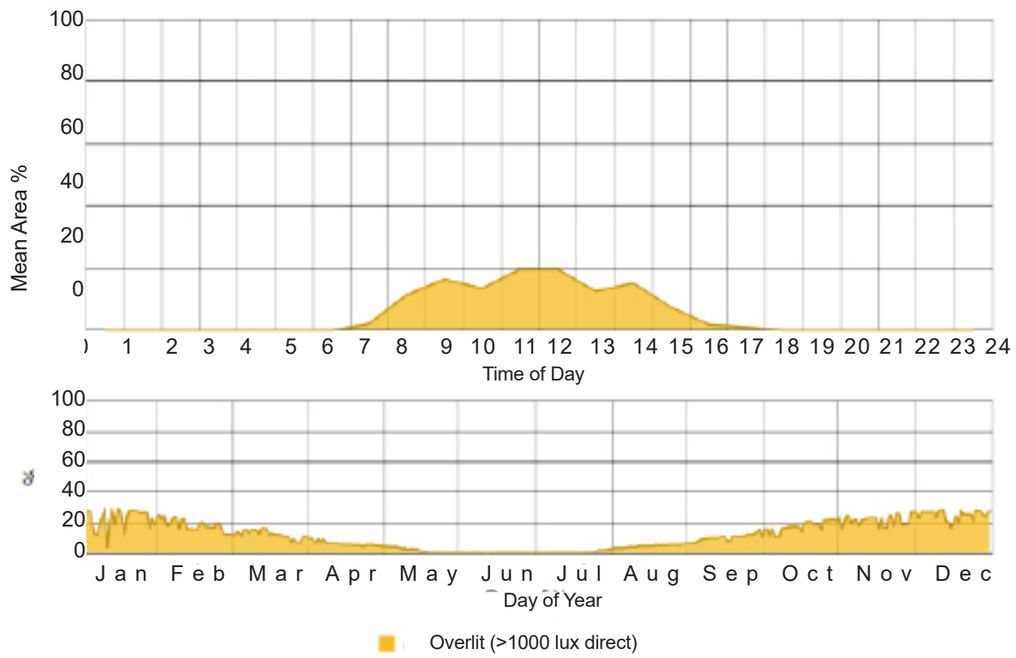
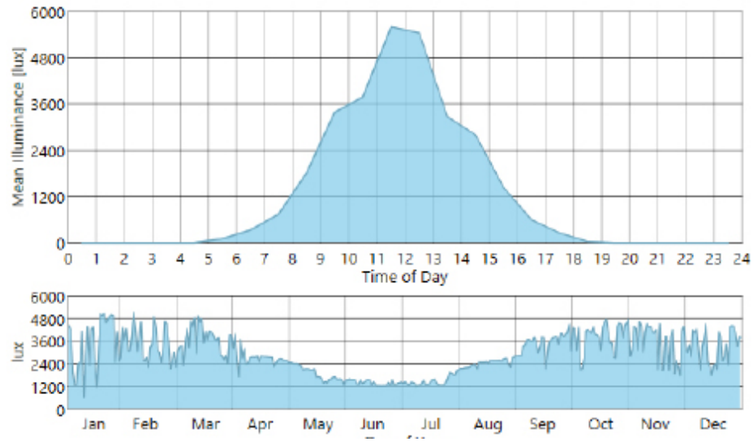


Figure 194 - Glare

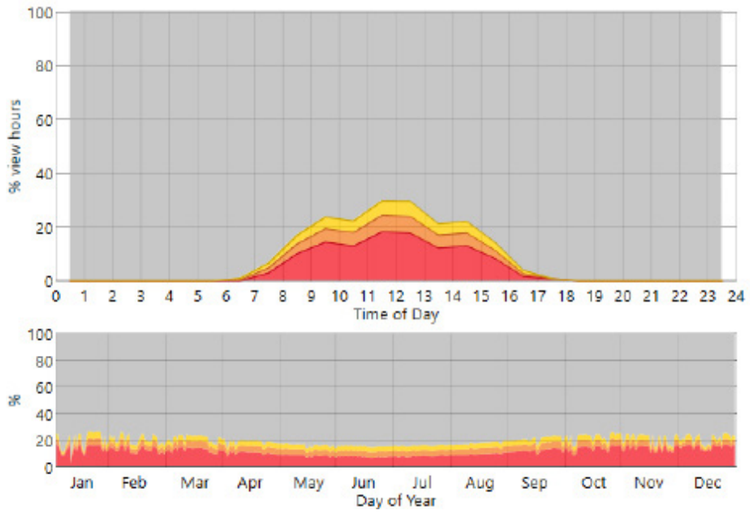




Graph 45 - Annual Solar Exposure



Graph 46 - Annual Glare

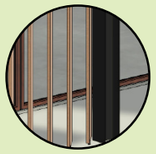


Graph 47 - Annual Mean Illuminance

OPTION 1- OFFICES

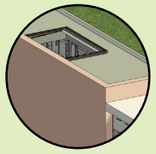
Horizontal Shading

Y



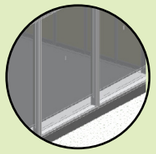
Vertical Shading

N



Skylights

N



Internal Shading

Y

Occupancy

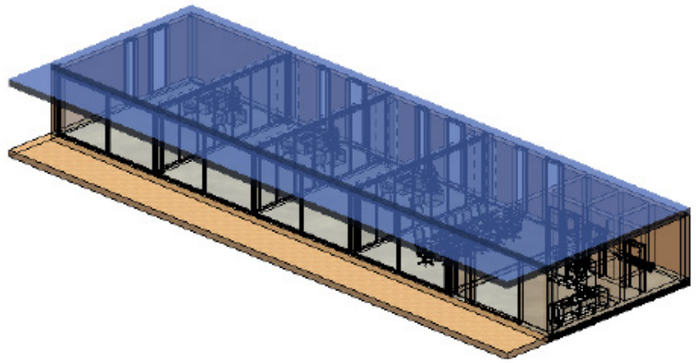
8 AM-6 PM DST

3 Credits

91.7% sDA

20.7% ASE

992 avg. lux

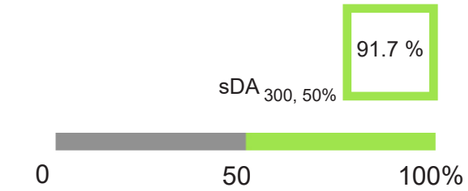


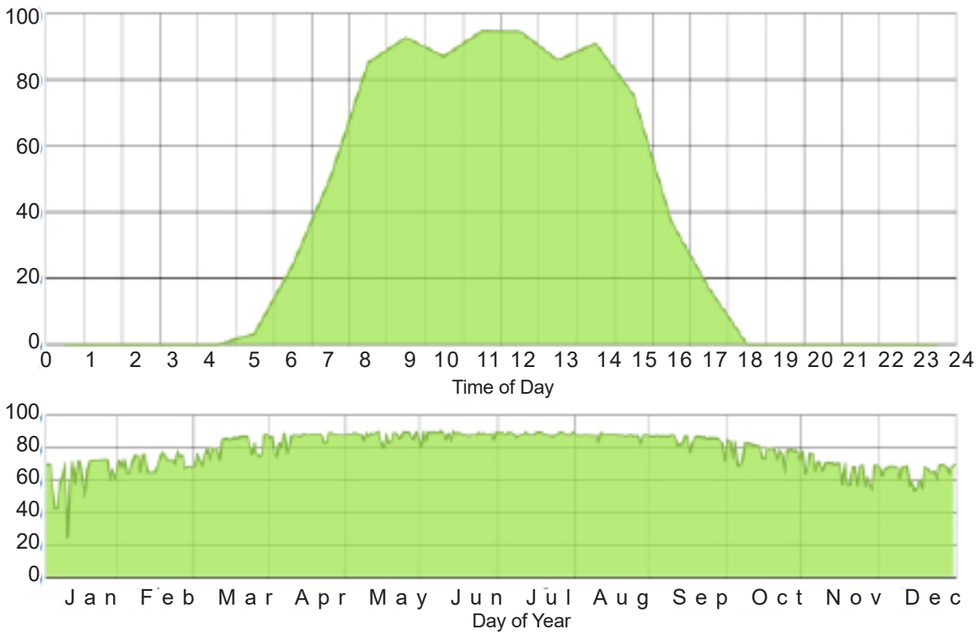
Visualization of the building and set parameters.

OPTION 1 - OFFICES

The option 1 for the office building with horizontal & no vertical shading elements. A curtain wall system on the SE to provide connectivity with the courtyard and the resilience and community hubs. A blind facade with vertical and narrow windows on the NW.The analysis reveals an ASE of 20.7% over the baseline ASE of 48.6% with the average annual illuminance reduced to 992 lux from 2876 lux. The sDA at 91.7% crosses the threshold of 75% to achieve a credit for the LEED v4.1certification but the high glare despite addition of blinds practically makes the interior of the office an uncomfortable working place. This iteration though improved over the baseline case would still need to be managed.

Figure 195 - sDA





Graph 48 - Annual sDA

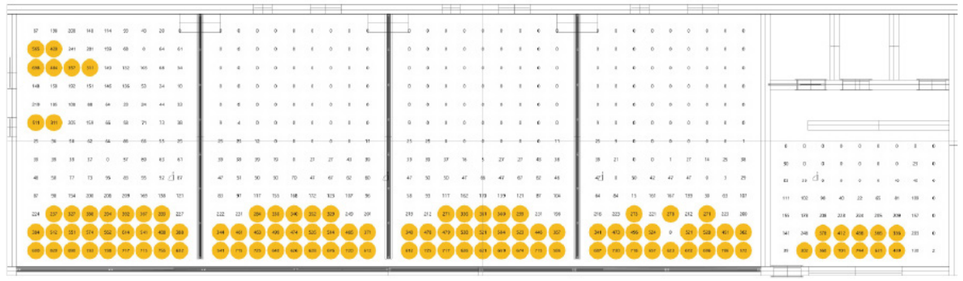


Figure 196 - ASE

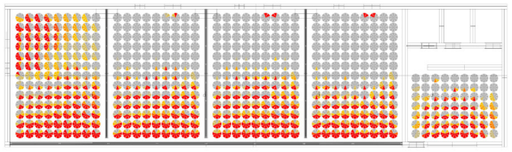
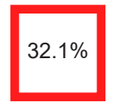
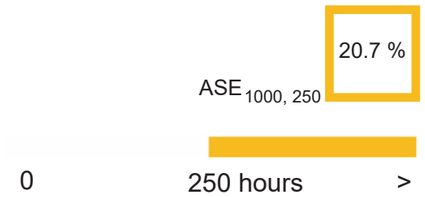


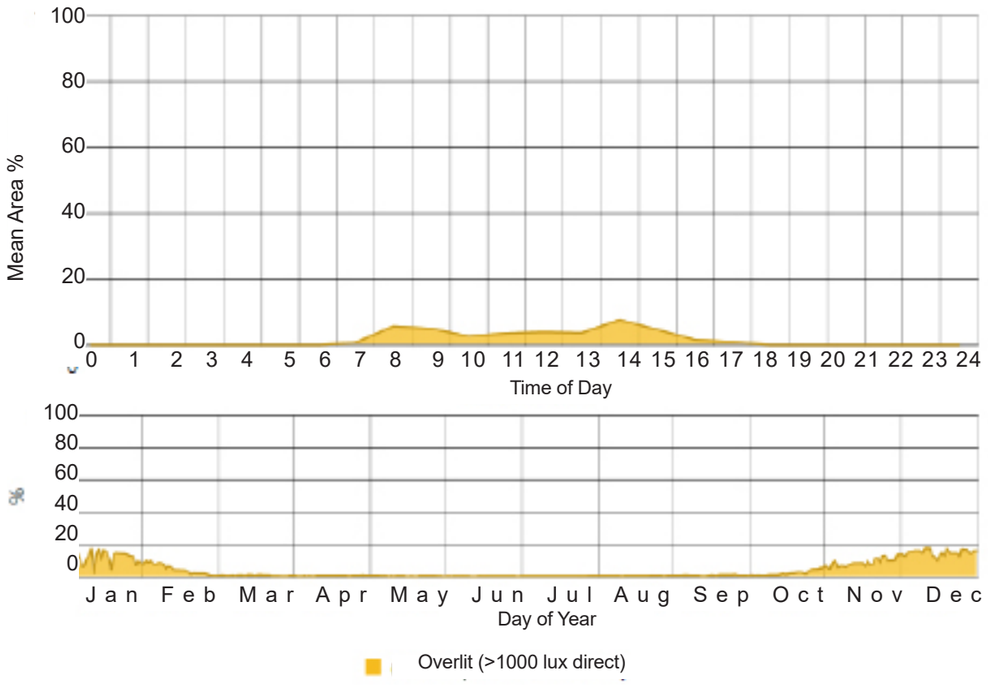
Figure 197 - Illuminance



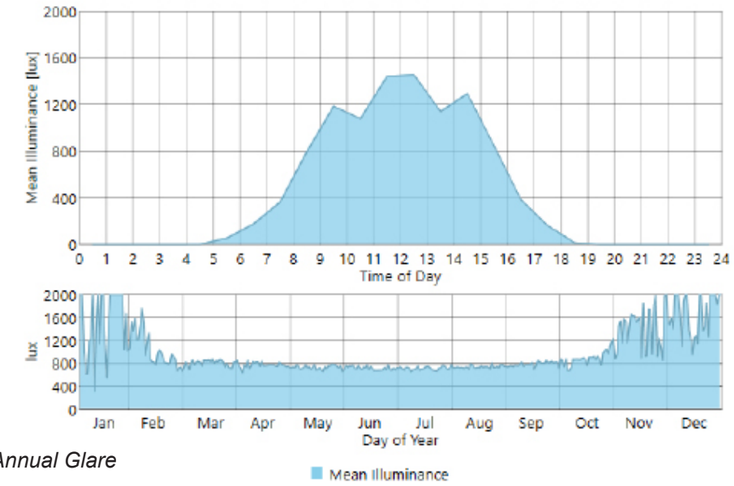
sDG (% views with Disturbing Glare > 5% of time)

Figure 198 - Glare

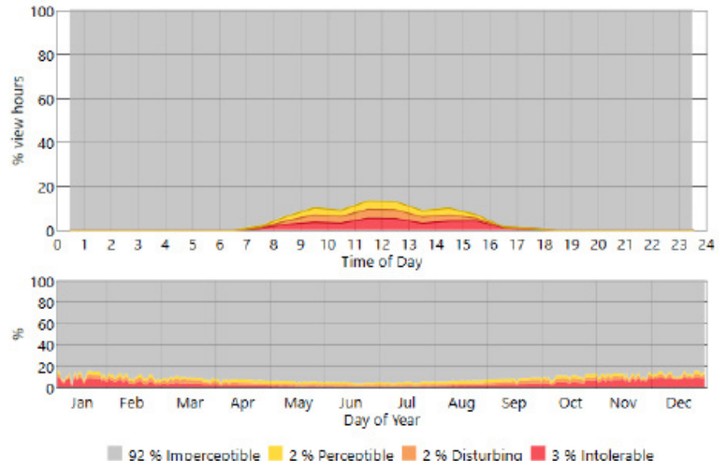




Graph 49 - Annual Solar Exposure



Graph 50 - Annual Glare

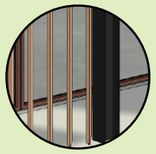


Graph 51 - Annual Mean Illuminance

OPTION 2- OFFICES

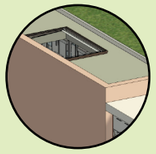
Horizontal Shading

Y



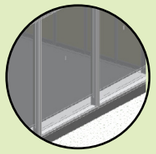
Vertical Shading

Y



Skylights

N



Internal Shading

Y

Occupancy

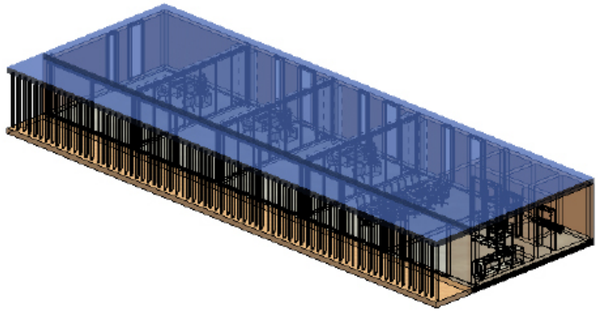
8 AM-6 PM DST

2 Credits

57.9% sDA

6.0% ASE

550 avg. lux



Visualization of the building and set parameters.

OPTION 2 - OFFICES

The option 2 for the office building with horizontal & vertical shading elements. A curtain wall system on the SE to provide connectivity with the courtyard and the resilience and community hubs characterized by accessible gaps. A blind facade with vertical and narrow windows on the NW.The analysis reveals an ASE of 6% over the 20.7% in option 1 and baseline ASE of 48.6% with the average annual illuminance at a manageable 550 lux from 992 lux in option 1 and baseline 2876 lux. The sDA at 57.9% and the glare of 6% managed by the dynamic vertical shading system and addition of interior blinds makes the interior of the office a comfortable working place.

SELECTED OPTIONEERING CASE

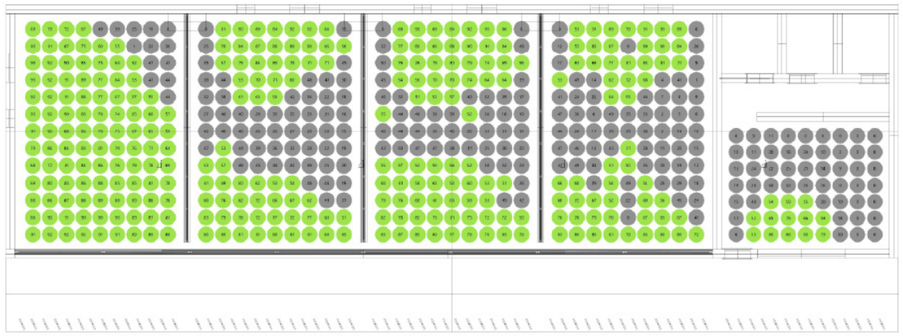
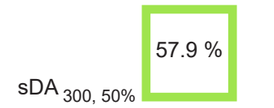
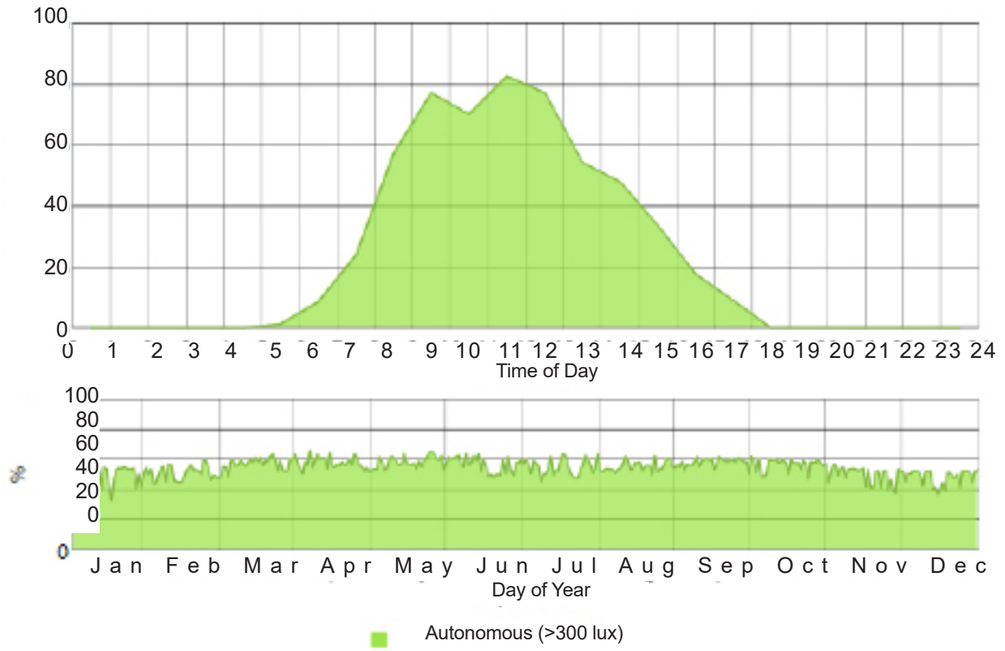


Figure 199 - sDA





Graph 52 - Annual sDA

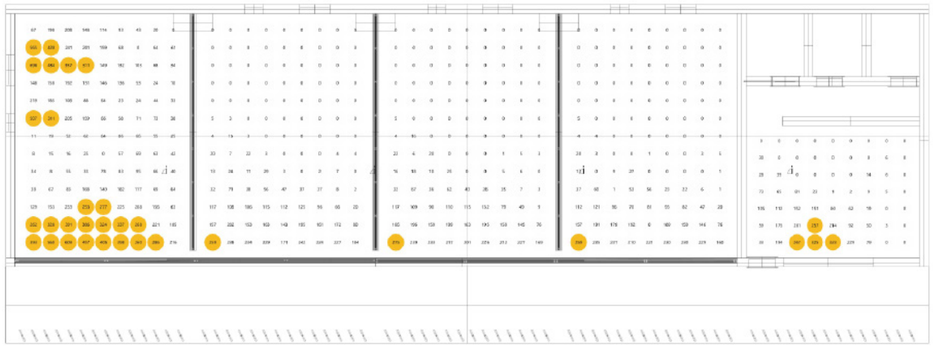


Figure 200 - ASE

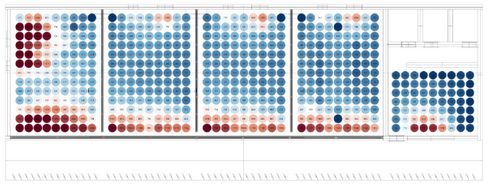


Figure 201 - Illuminance

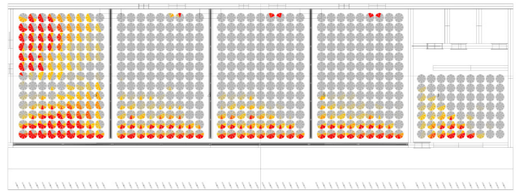
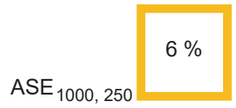
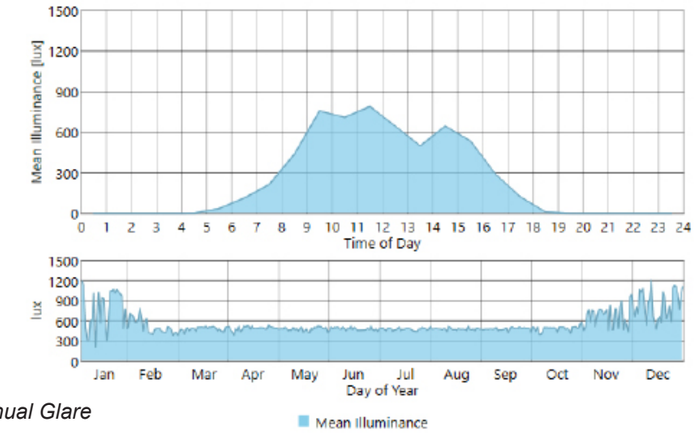
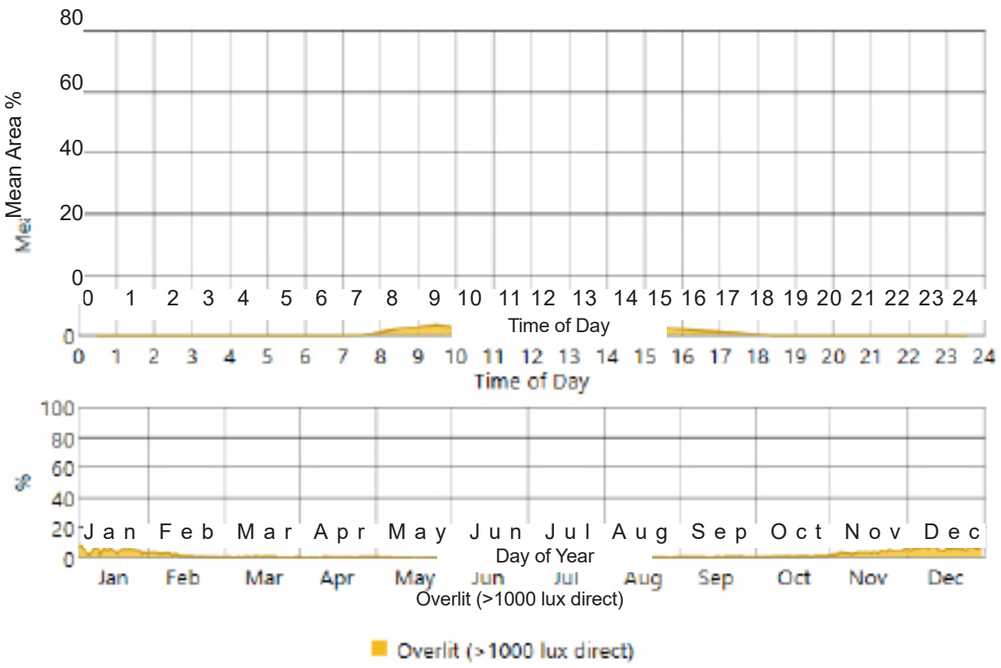


Figure 202 - Glare

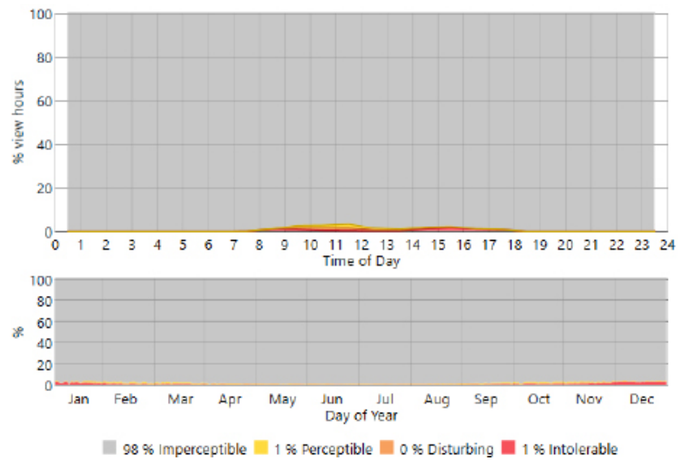




Graph 54 - Annual Glare



Graph 53 - Annual Solar Exposure



Graph 55 - Annual Mean Illuminance

THERMAL ANALYSIS

ClimateStudio supports multi zone thermal simulations using the US Department of Energy's EnergyPlus whole building simulation program. The software was used to run thermal zone analysis for the various buildings in the project.

ENERGY USE INTENSITY (EUI)

Energy use intensity (EUI) is an indicator of the energy efficiency of a building's design and/or operations. EUI can be thought of as the miles per gallon rating of the building industry. It is used in a number of different ways including to set a target for energy performance before beginning design, to benchmark a building's designed or operational performance against others of the same building type, or to evaluate compliance against energy code requirements. It is important to remember that EUI varies with building type as analyzed for the project.

Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.

SITE ENERGY

Site energy is the amount of energy consumed at the building site indicated in utility statements or via metering for an existing building or as predicted by energy modeling software for a building in design. Utility delivered energy plus Renewable Energy generated and used onsite are included because they are required to operate the building. Renewable energy exported to the electric grid is not included because it is not used for building operations. Site EUI is the amount of site energy used in one year divided by the total square feet of building area.

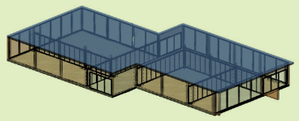
ENERGY USE

Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.

ENERGY FLOW

Energy Flow indicates the monthly sum of heat flows in and out of a zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).

RESILIENCE HUB BASELINE



SITE EUI kWh/ m2

100

EUI BASELINE kWh/ m2

249

€ /m2/ a

10

kg CO2/m2/a

48

SAVED vs BASELINE

57%

Program	Resilience Hub
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	12.5
Illuminance Target (lux)	500
Dimming Type	OFF

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.5

WATER

COP	1
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.97	0.409	0.59

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	2

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	2

MECH. VENTILATION

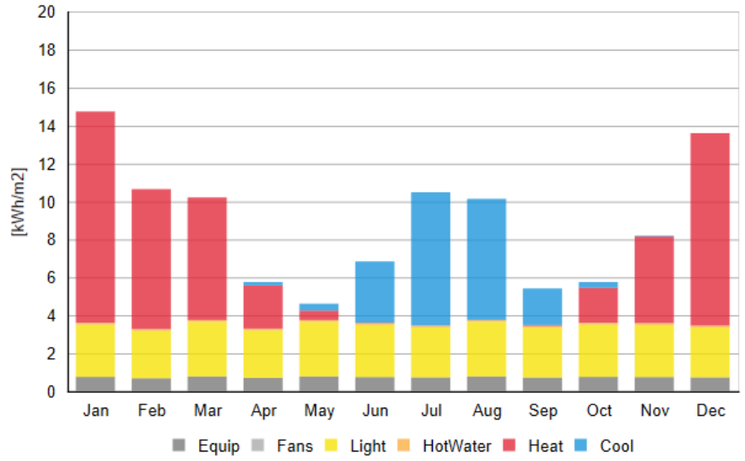
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

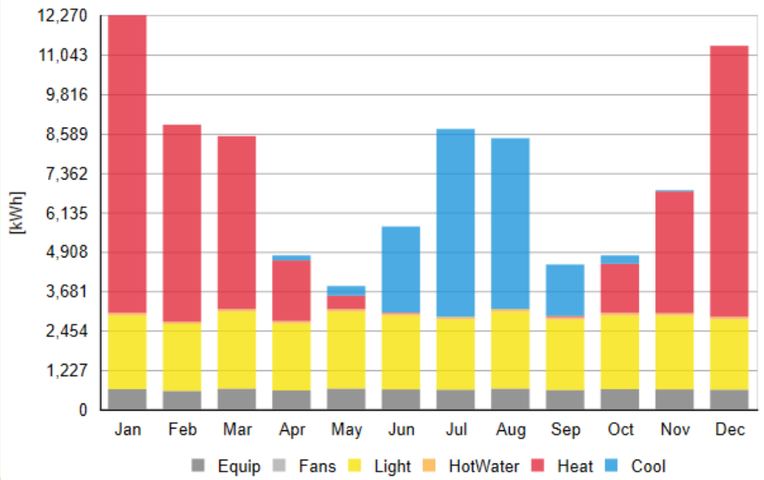
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

BASELINE OPTIONEERING

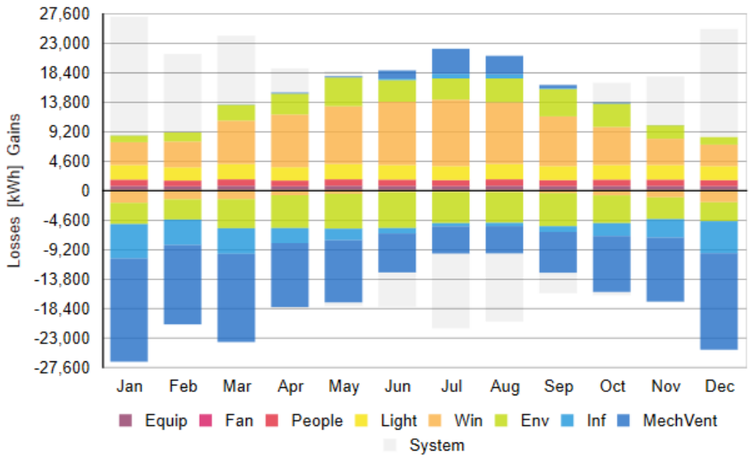
In order to reach an understanding of how the resilience hub performs in terms of energy and thermal comfort, the parameters were set as described. The performance parameters were chosen at a bare minimum in the baseline. The lack of shading elements and presence of curtain walls contribvute considerably to a site EUI of 100kWh/m2 despite a saving of 57% over the baseline EUI standard.



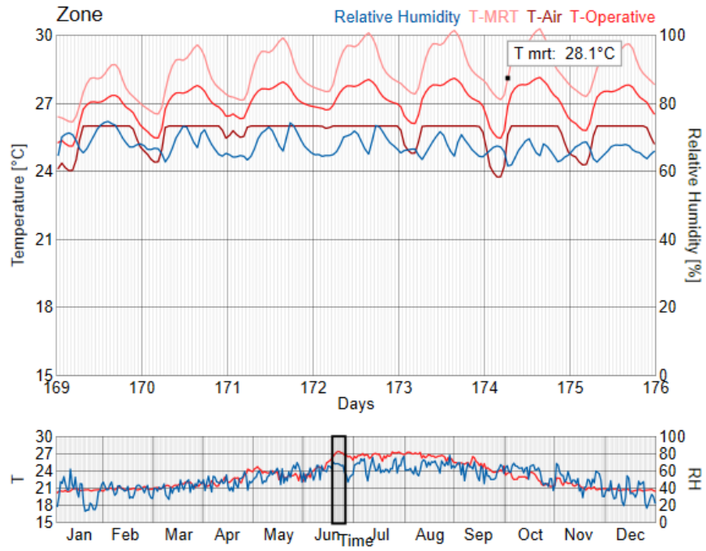
Graph 56 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



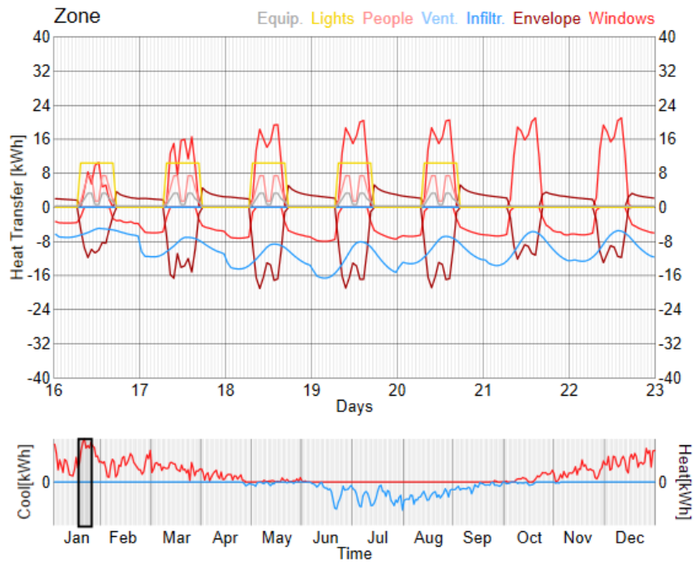
Graph 57 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



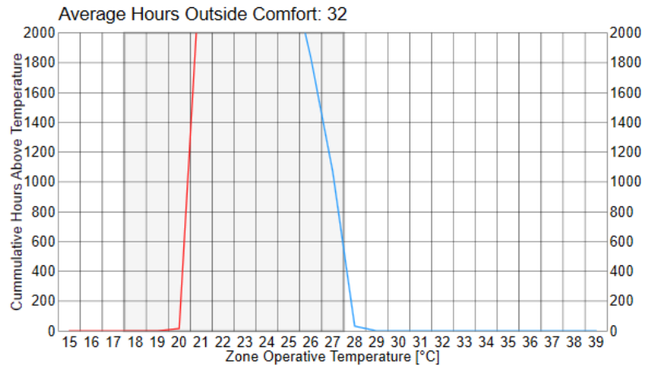
Graph 58 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 59 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

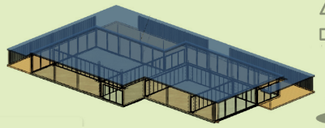


Graph 60 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 61 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

RESILIENCE HUB OPTIONEERING 1



SITE EUI kWh/ m2

73

EUI BASELINE kWh/ m2

249

€ /m2/ a

6

kg CO2/m2/a

30

SAVED vs BASELINE

71%

Program	Resilience Hub
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	10.0
Illuminance Target (lux)	500
Dimming Type	STEPPED

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.3

WATER

COP	2
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.58	0.163	0.291

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	2.5

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	2.5

MECH. VENTILATION

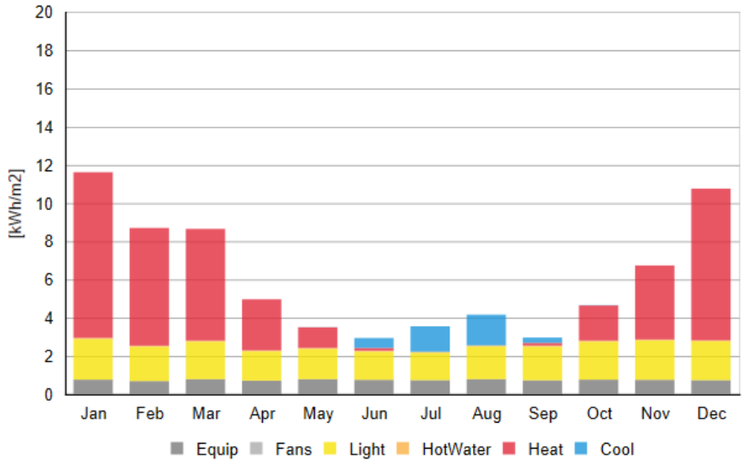
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65

NAT. VENT

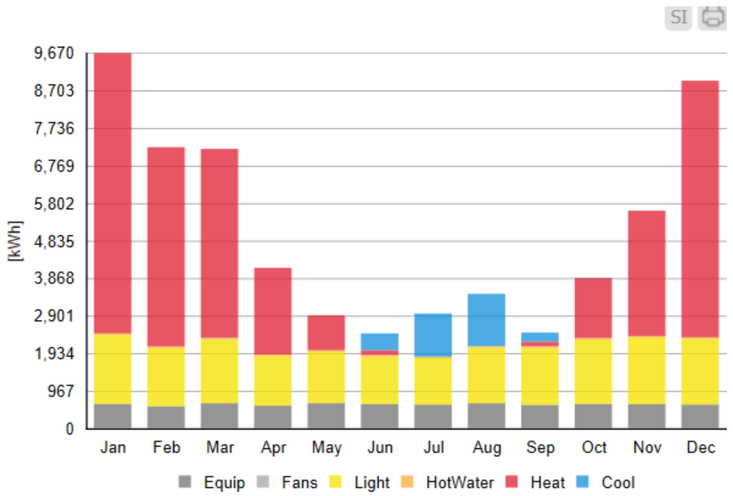
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

OPTIONEERING 1

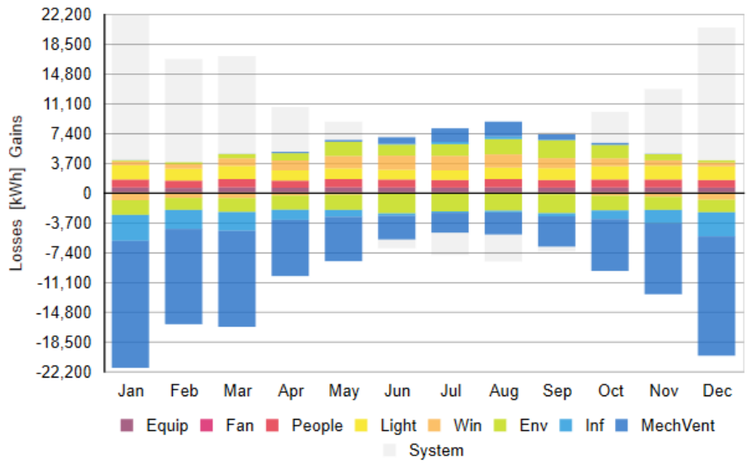
The parameters for this iteration of the resilience hub were set as described. The performance parameters chosen were improved along with the addition of the shading systems contribute considerably to reducing site EUI of 100kWh/m2 in baseline to 73kWh'm2. Lighting dimming type chosen was stepped to regulate ambiet lighting better and the infiltration coefficient improved in regards to a more airtight envelope. An air system was adopted and the glazing assembly improved. Natural ventilation schedules were not adopted for this iteration.



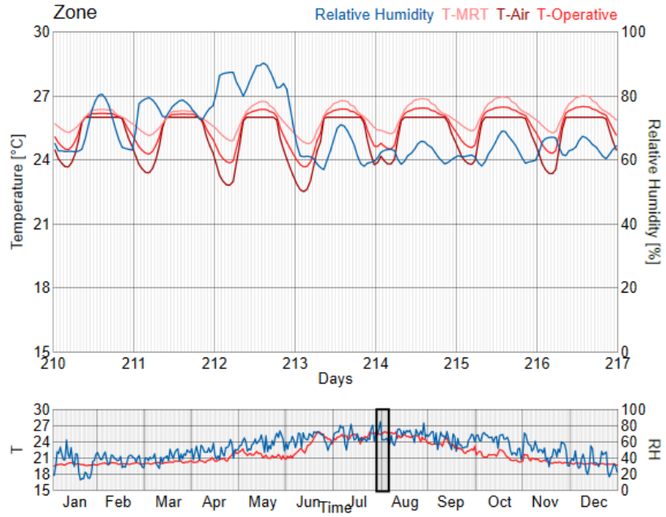
Graph 62 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



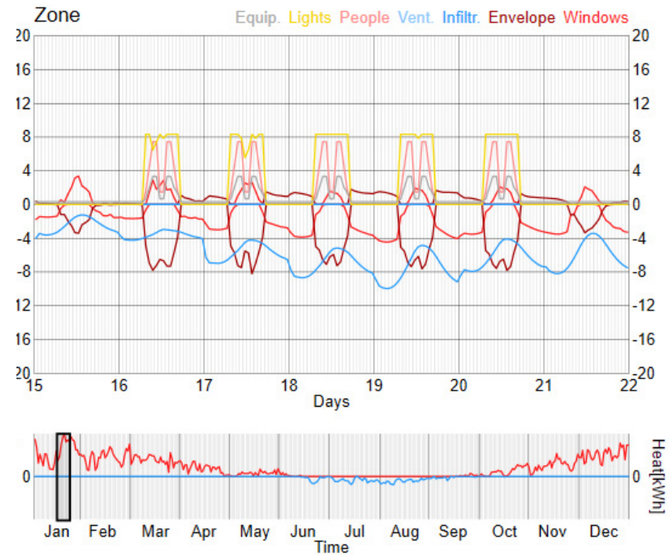
Graph 63 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



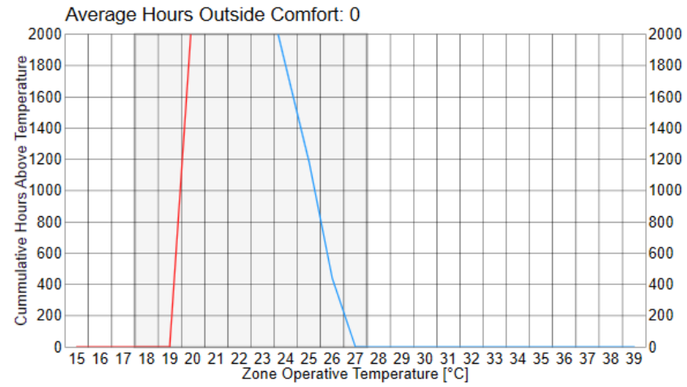
Graph 64 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 65 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

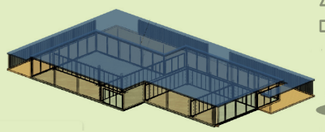


Graph 66 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 67 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

RESILIENCE HUB OPTIONEERING 2



SITE EUI kWh/ m2

53

EUI BASELINE kWh/ m2

249

€ /m2/ a

4

kg CO2/m2/a

22

SAVED vs BASELINE

79%

Program	Lecture Hall
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	10.0
Illuminance Target (lux)	500
Dimming Type	CONTINUOUS

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.2

WATER

COP	2.5
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.57	0.216	0.512

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	3.5

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	3.5

MECH. VENTILATION

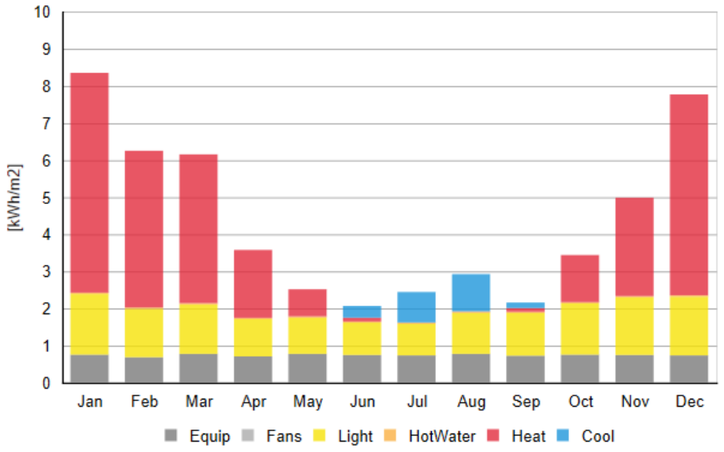
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

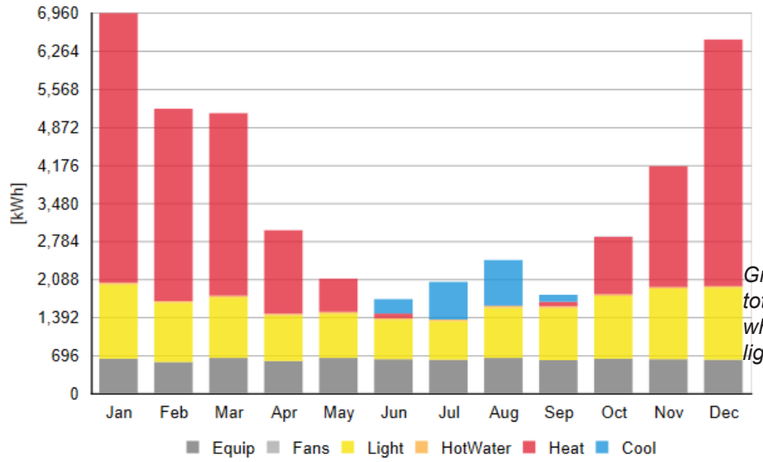
Flow Type	Buoyancy
Nat Vent Set Point (•C)	22
Nat Vent Min Out Air Temp (•C)	0
Nat Vent Max Out Air Temp (•C)	30

OPTIONEERING 2

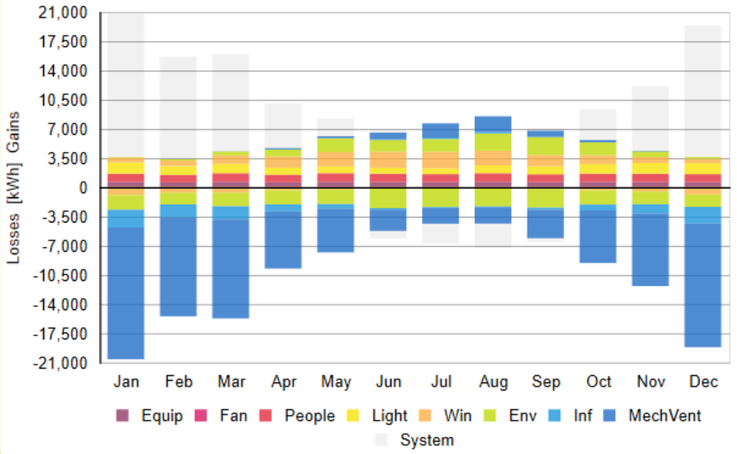
The parameters for this iteration of the resilience hub were set as described. The performance parameters chosen were further improved considerably reducing site EUI of from 73kWh/m2 to 53 kWh/m2. Lighting dimming type chosen was set to continuous to regulate ambiet lighting in the most efficient manner and the infiltration coefficient slightly improved to 0.2 for airtight envelope to offset further energy losses. A ground heat exchanger with efficiency of 3.5 was adopted and the glazing assembly improved. Natural ventilation schedules were adopted for this iteration with an airflow network simulated by the software.



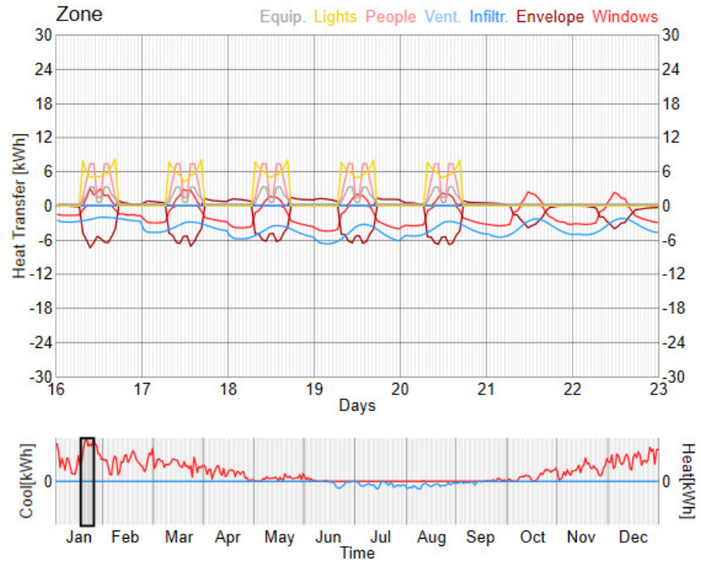
Graph 68 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



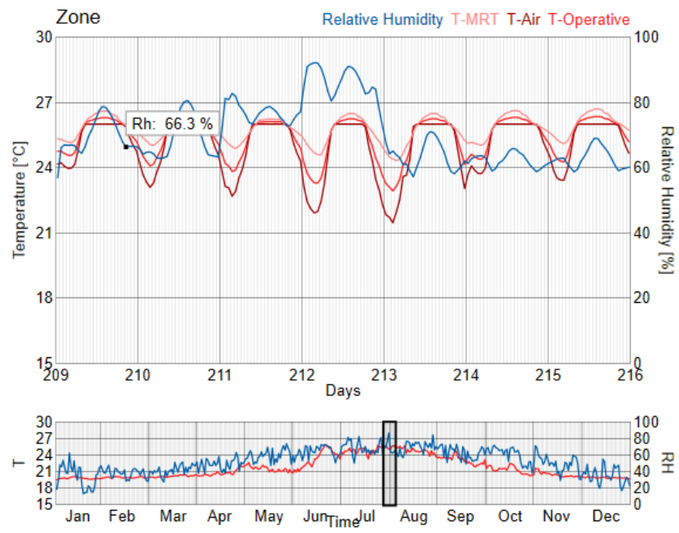
Graph 69 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



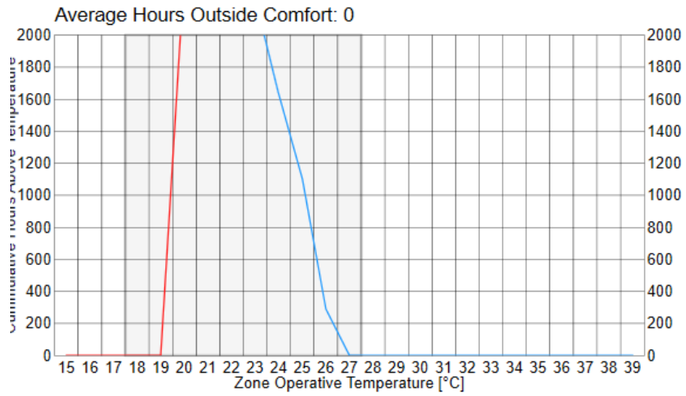
Graph 70 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 71 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

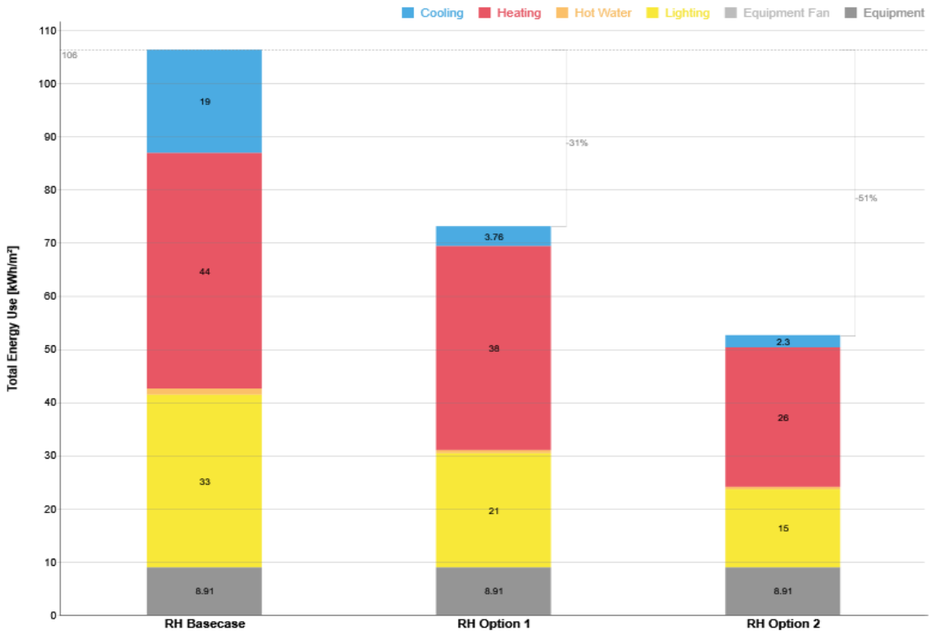


Graph 72 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



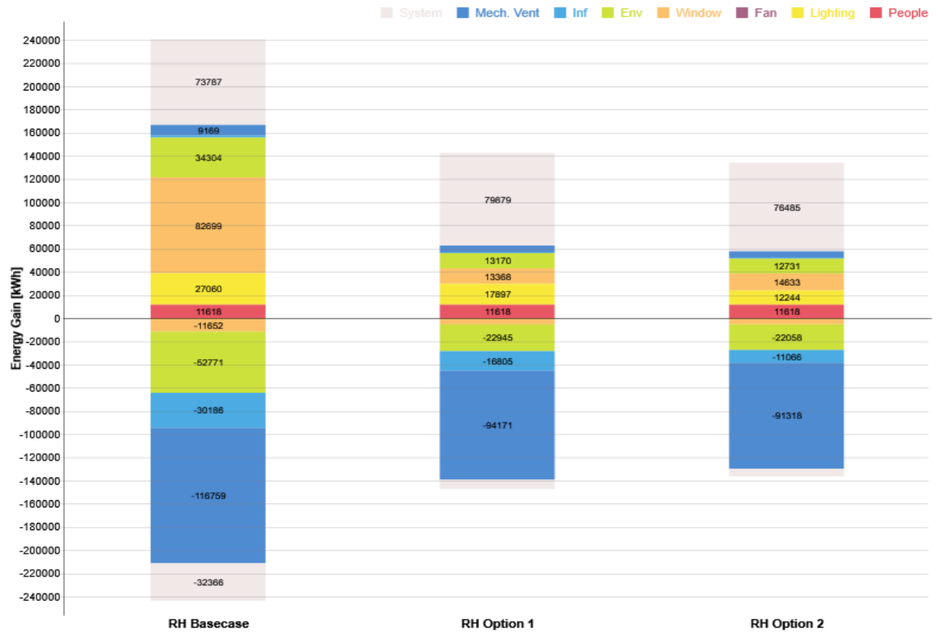
Graph 73 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

SELECTED ITERATION FOR ENERGY AND THERMAL COMFORT : OPTIONEERING 2

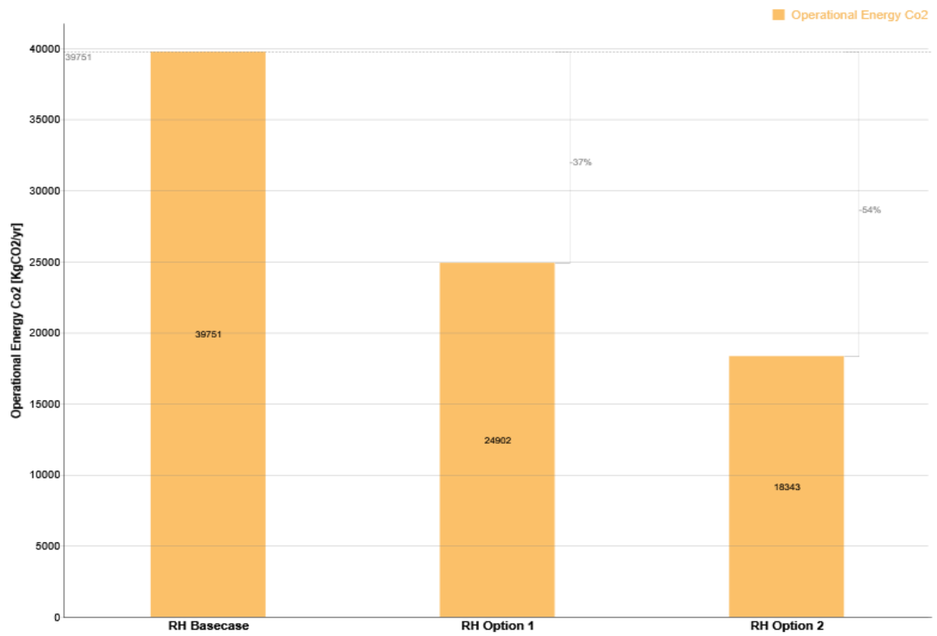


Graph 74 - EUI comparison: Optionneering 1 & 2 vs Baseline.

Graph 75 - Total Energy Use comparison: Optionneering 1 & 2 vs Baseline.

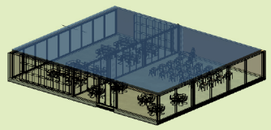


Graph 76 - Energy Flow comparison: Optionneering 1 & 2 vs Baseline.



Graph 77 - Operational Energy CO2 (KgC02/yr): Optionneering 1 & 2 vs Baseline.

COMMUNITY HUB
BASE CASE



SITE EUI
kWh/ m2

100

EUI
BASELINE
kWh/ m2

249

€ /m2/ a

9

kg CO2/m2/a

45

SAVED vs
BASELINE

60%

Program	Community Hub
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	12.5
Illuminance Target (lux)	500
Dimming Type	OFF

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.5

WATER

COP	1
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.97	0.216	0.512

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	2

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	2

MECH. VENTILATION

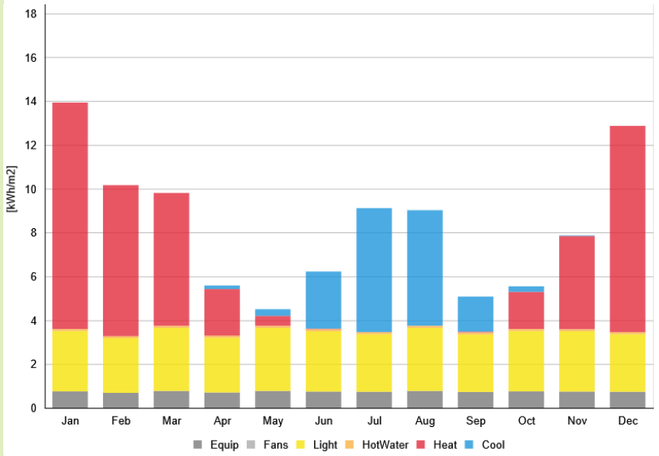
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

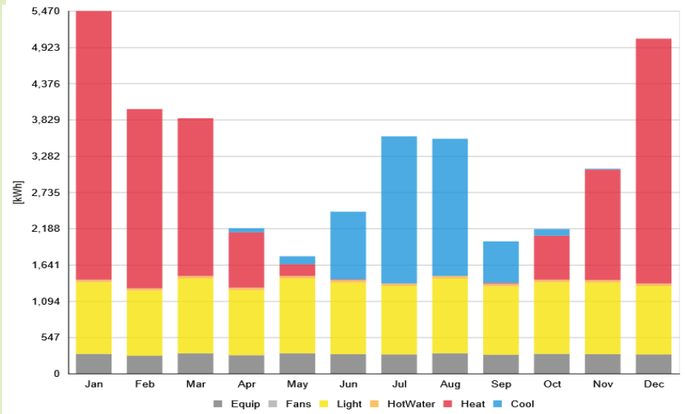
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

BASELINE OPTIONEERING

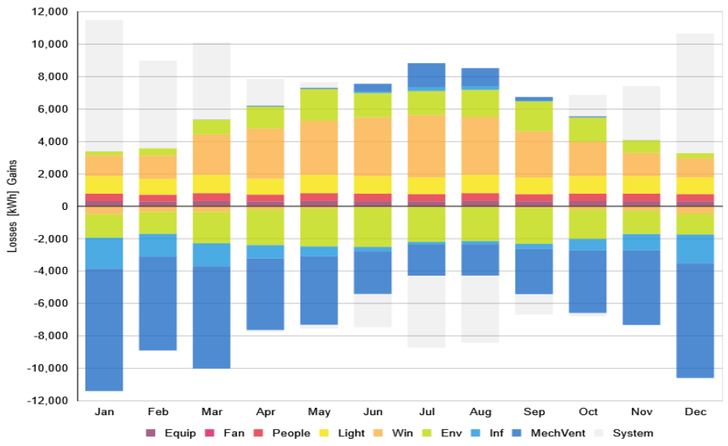
In order to reach an understanding of how the Community Hub performs in terms of energy and thermal comfort, the parameters were set as described. The performance parameters were chosen at a bare minimum in the baseline. The lack of shading elements and presence of curtain walls contribute considerably to a site EUI of 100kWh/m2 despite a saving of 60% over the baseline EUI standard.



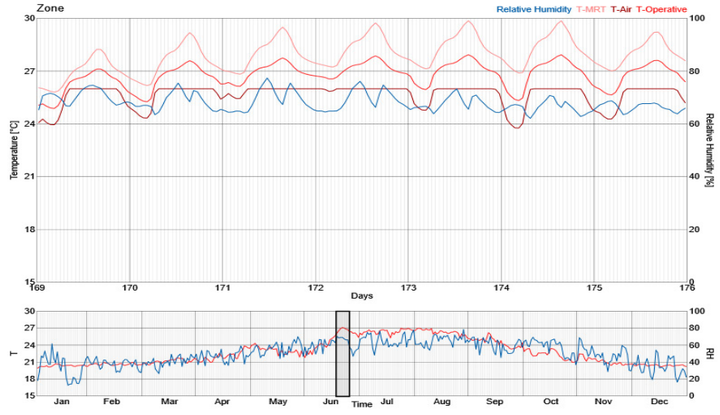
Graph 78 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



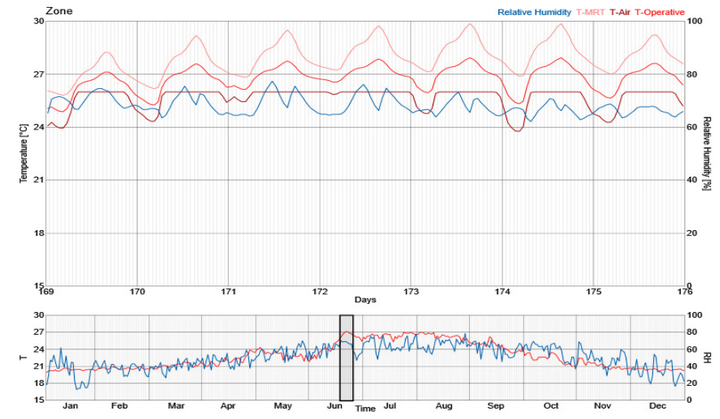
Graph 79 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



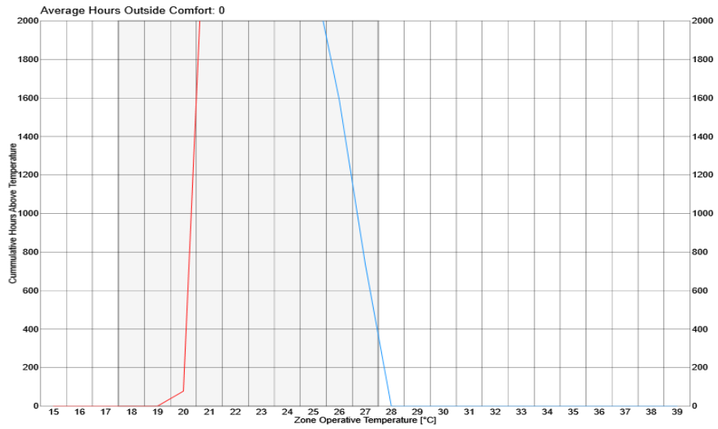
Graph 80 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 81 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

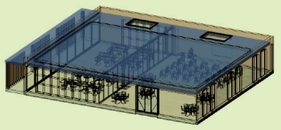


Graph 82 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 83 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

COMMUNITY HUB OPTIONEERING 1



SITE EUI kWh/ m2

75

EUI BASELINE kWh/ m2

249

€ /m2/ a

7

kg CO2/m2/a

32

SAVED vs BASELINE

70%

Program	Lecture Hall
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	10.0
Illuminance Target (lux)	500
Dimming Type	STEPPED

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.3

WATER

COP	2
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.58	0.163	0.291

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	2.5

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	2.5

MECH. VENTILATION

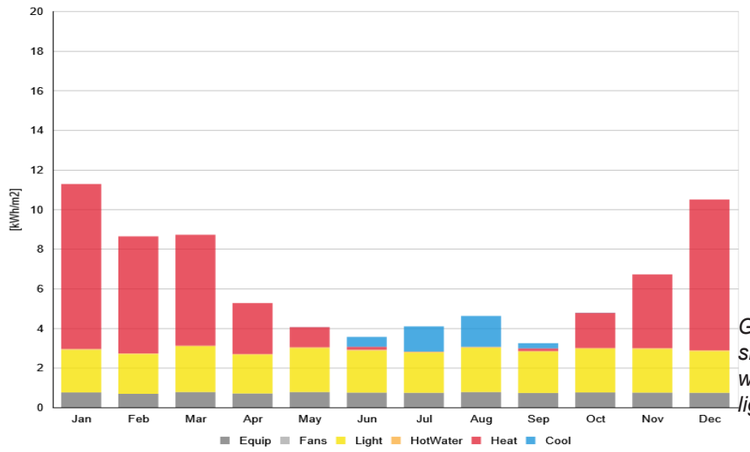
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

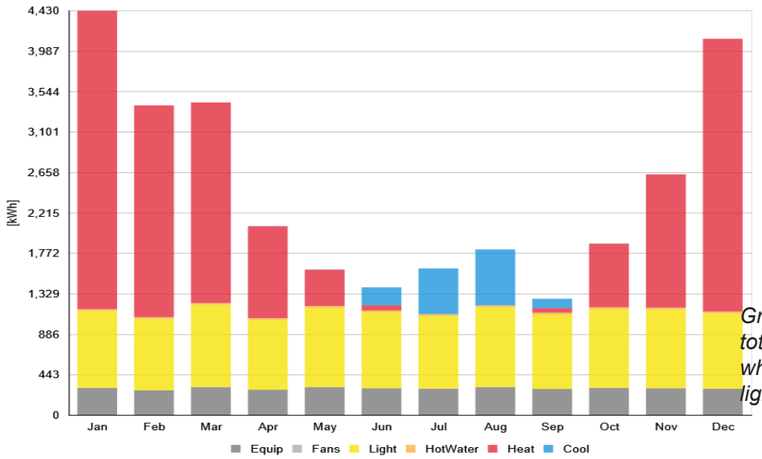
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

OPTIONEERING 1

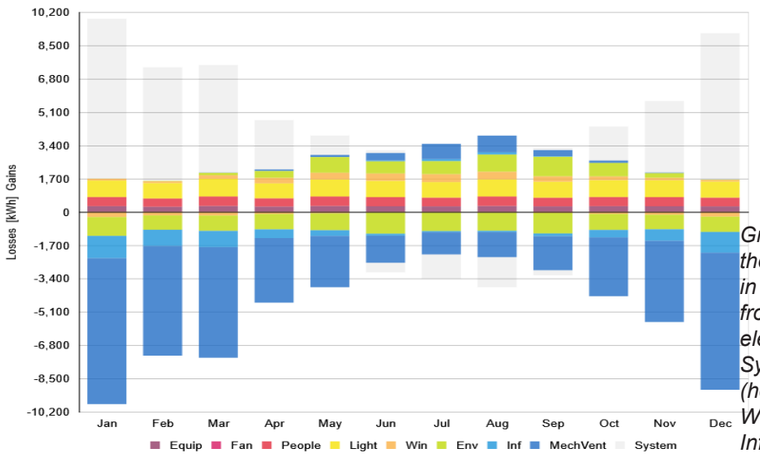
The parameters for this iteration of the community hub were set as described. The performance parameters chosen were improved along with the addition of the shading systems and removal of curtain wall and additionof skylights contribute considerably to reducing site EUI to 75 kWh/m2.Lighting dimming type chosen was stepped to regulate ambiet lighting better and the infiltration coefficient improved in regards to a more airtight envelope. An air system was adopted and the glazing assembly improved.Natural ventilation schedules were not adopted for this iteration.



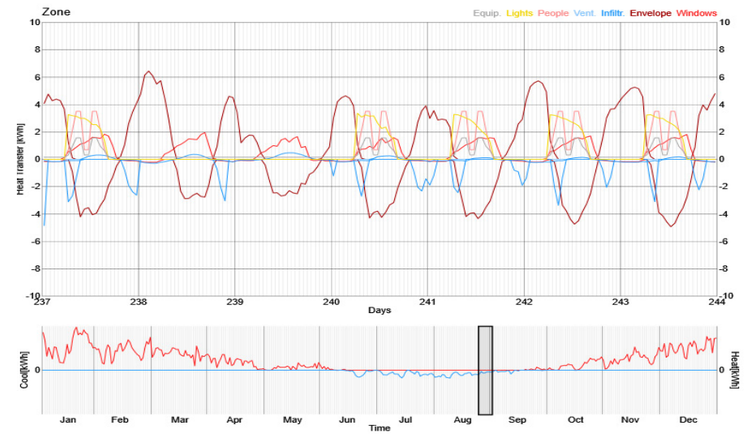
Graph 84 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



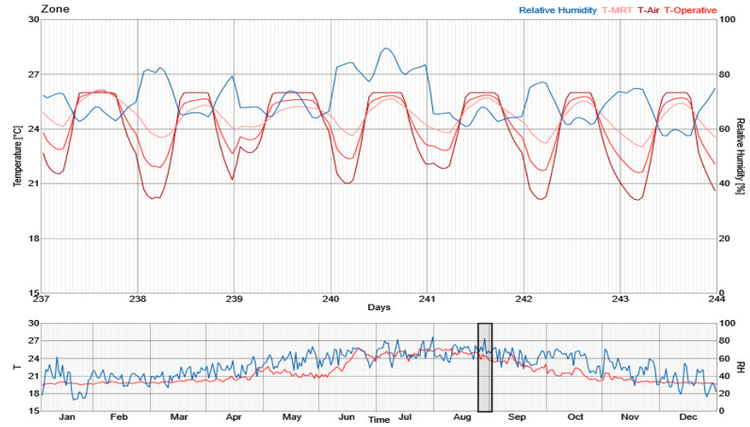
Graph 85 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



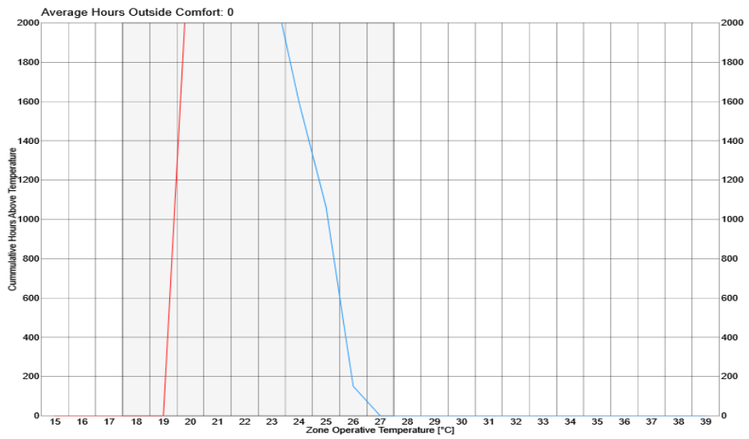
Graph 86 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 87 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

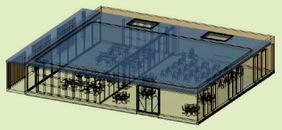


Graph 88 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 89 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

COMMUNITY HUB OPTIONEERING 2



SITE EUI kWh/ m2

56

EUI BASELINE kWh/ m2

249

€ /m2/ a

5

kg CO2/m2/a

24

SAVED vs BASELINE

78%

Program	Lecture Hall
Use Type	Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	4
Lighting Power Density	10.0
Illuminance Target (lux)	500
Dimming Type	CONTINUOUS

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.2

WATER

COP	2.5
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.57	0.216	0.512

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	3.5

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	3.5

MECH. VENTILATION

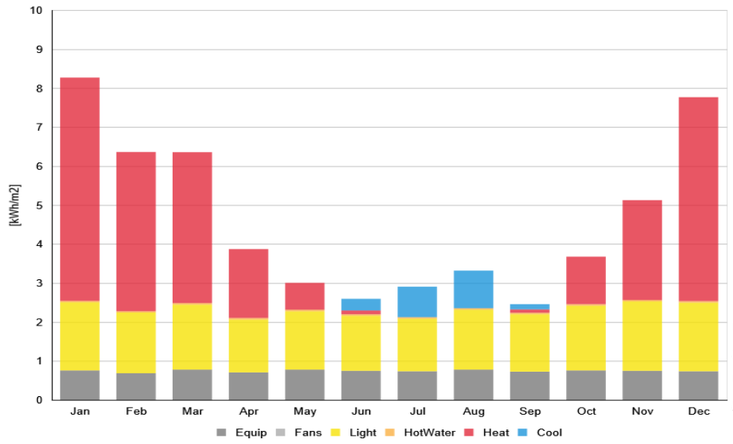
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

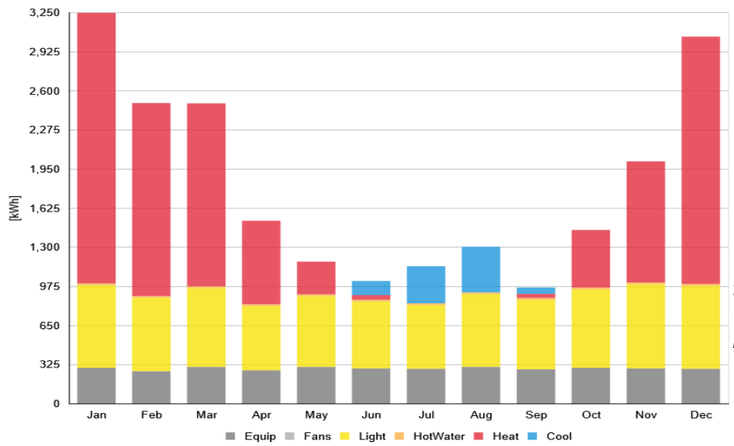
Flow Type	Buoyancy
Nat Vent Set Point (•C)	22
Nat Vent Min Out Air Temp (•C)	0
Nat Vent Max Out Air Temp (•C)	30

OPTIONEERING 2

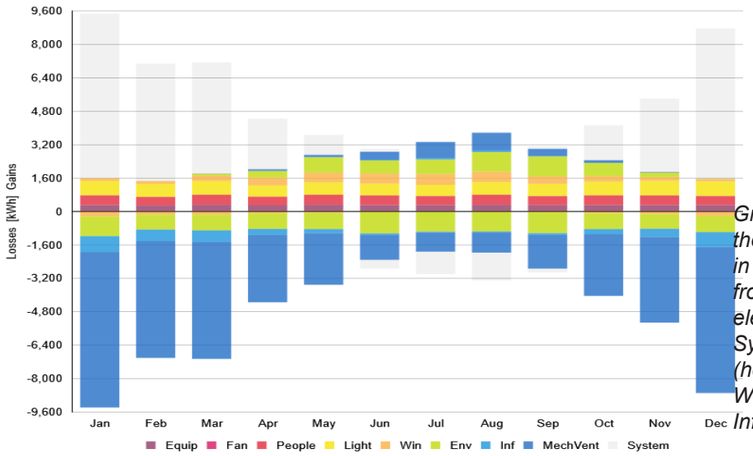
The parameters for this iteration of the community hub were set as described. The performance parameters chosen were further improved considerably reducing site EUI of from 75 kWh/m2 to 56 kWh/m2. Lighting dimming type chosen was set to continuous to regulate ambiet lighting in the most efficient manner and the infiltration coefficient slightly improved to 0.2 for airtight envelope to offset further energy losses. A ground heat exchanger with efficiency of 3.5 was adopted and the glazing assembly improved. Natural ventilation schedules were adopted for this iteration with an airflow network simulated by the software.



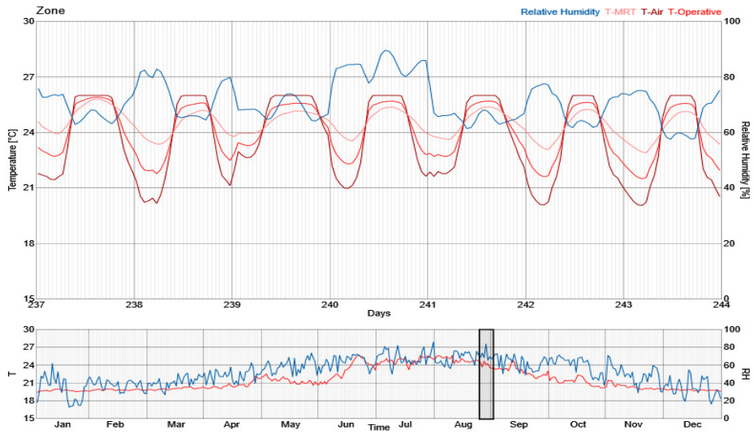
Graph 90 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



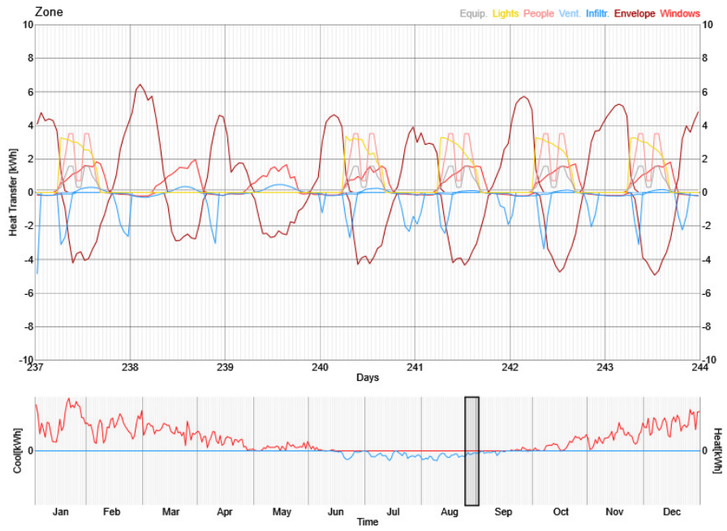
Graph 91 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



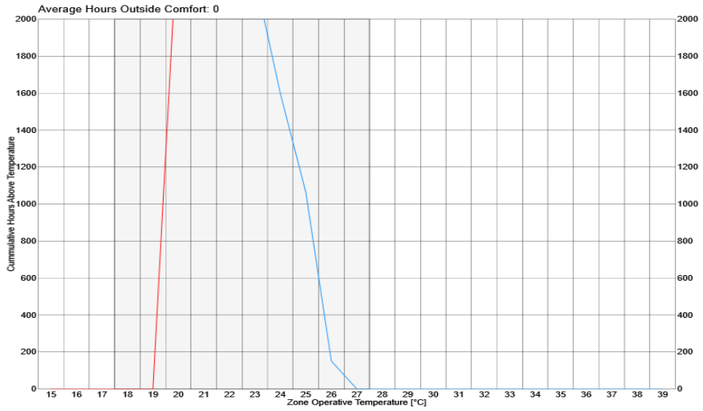
Graph 92 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 93 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

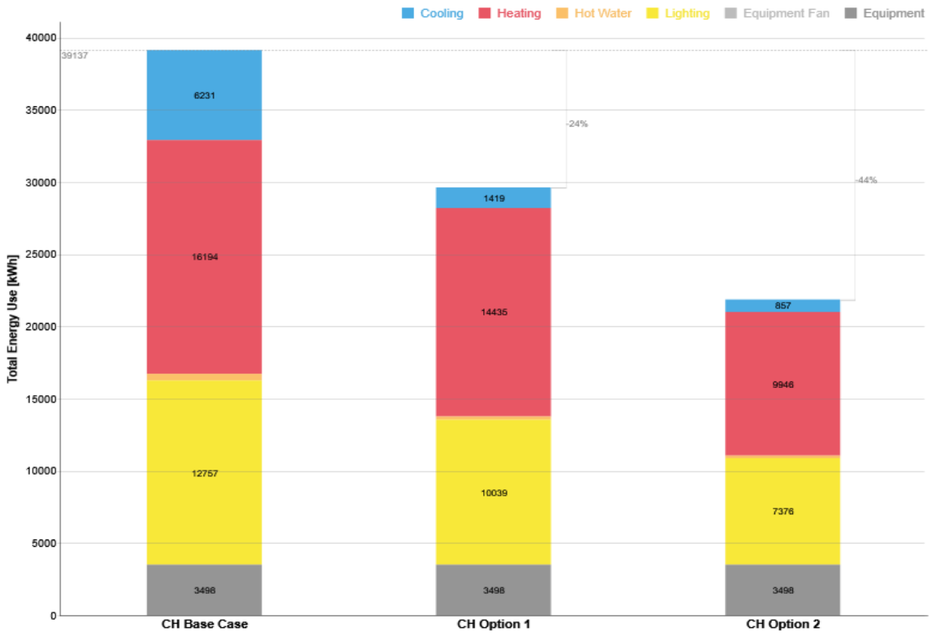


Graph 94 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.

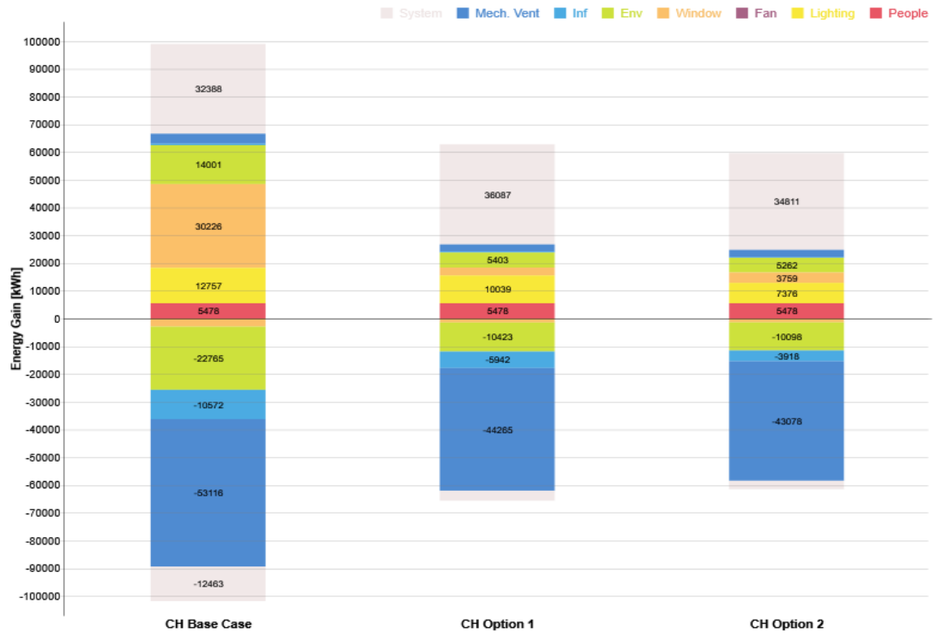


Graph 95 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

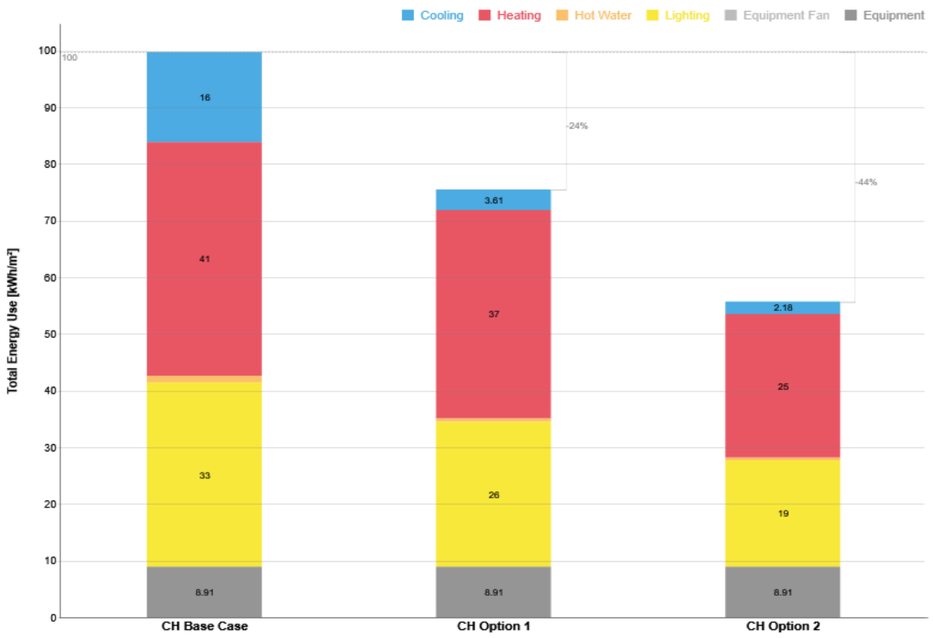
SELECTED ITERATION FOR ENERGY AND THERMAL COMFORT : OPTIONEERING 2



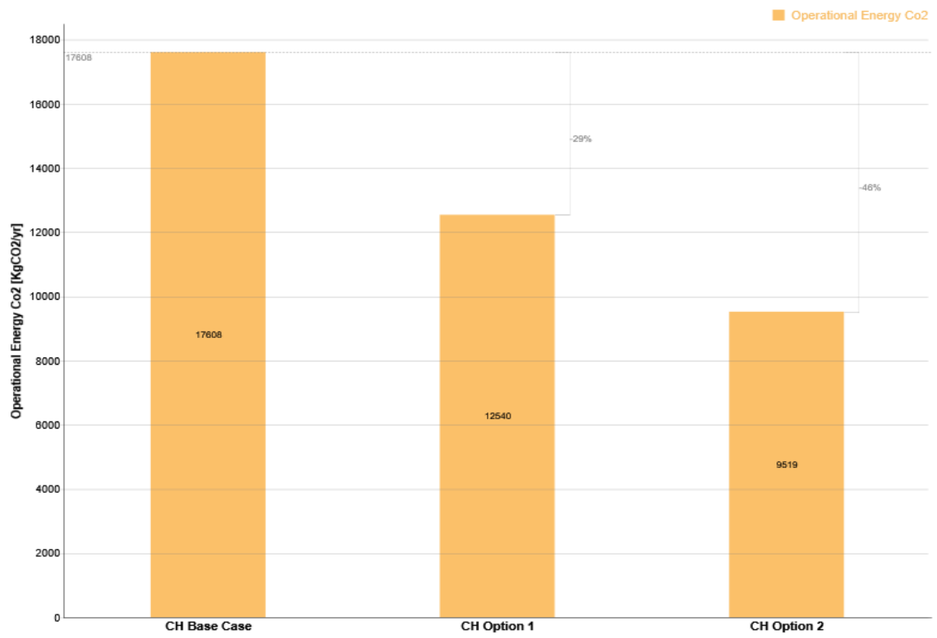
Graph 96 - EUI comparison: Optionneering 1 & 2 vs Baseline.



Graph 98 - Energy Flow comparison: Optionneering 1 & 2 vs Baseline.

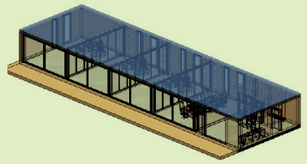


Graph 97 - Total Energy Use comparison: Optionneering 1 & 2 vs Baseline.



Graph 99 - Operational Energy CO2 (KgC02/yr): Optionneering 1 & 2 vs Baseline.

OFFICES
BASE CASE



SITE EUI
kWh/ m2

65

EUI
BASELINE
kWh/ m2

284

€ /m2/ a

6

kg CO2/m2/a

35

SAVED vs
BASELINE

77%

Program	Office
Use Type	Office + Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	5
Lighting Power Density	10
Illuminance Target (lux)	500
Dimming Type	OFF

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.3

WATER

COP	2
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.65	0.214	0.512

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	2

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	2

MECH. VENTILATION

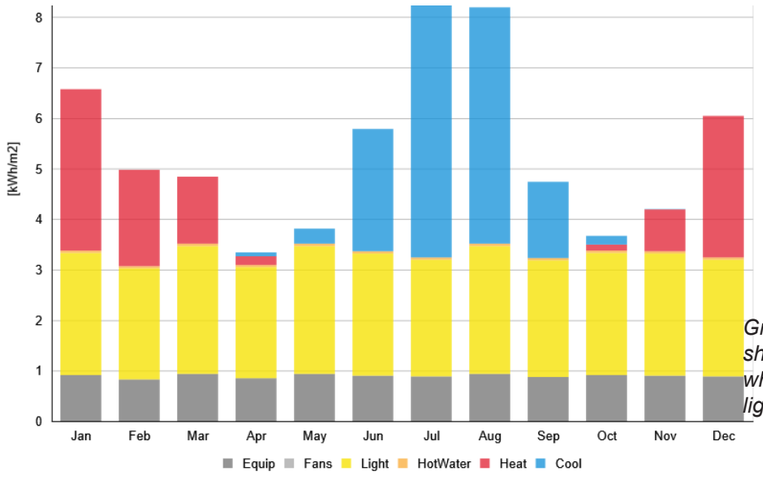
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

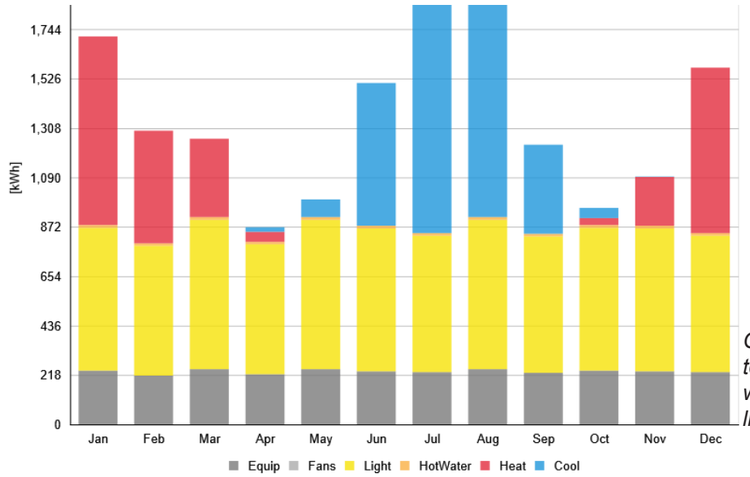
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

BASELINE OPTIONEERING

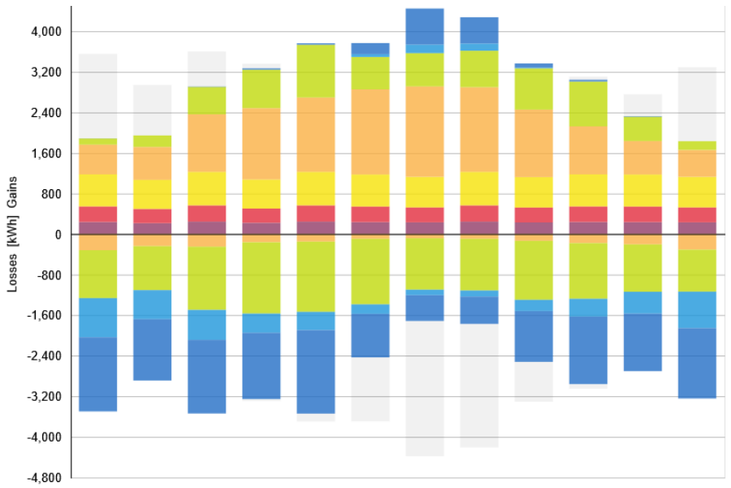
In order to reach an understanding of how the offices performs in terms of energy and thermal comfort, the parameters were set as described. The performance parameters were chosen at a bare minimum in the baseline. The lack of shading elements and presence of curtain walls contribute considerably to a site EUI of 65kWh/m2 despite a saving of 77% over the baseline EUI standard.



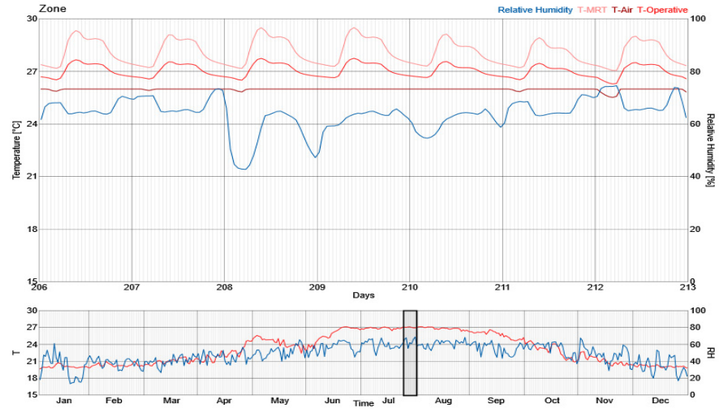
Graph 100 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



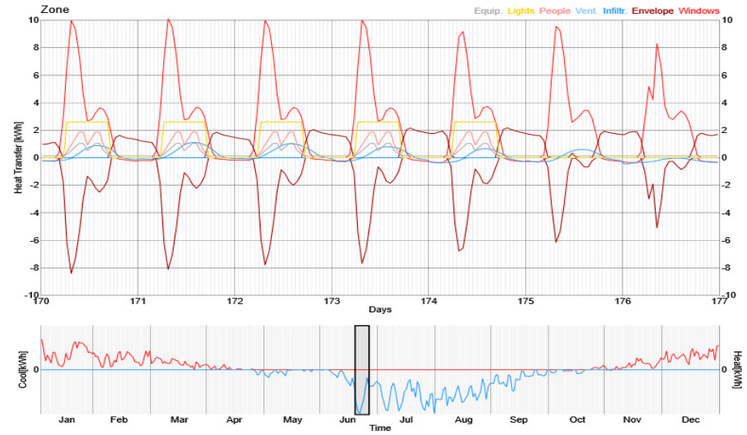
Graph 101 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



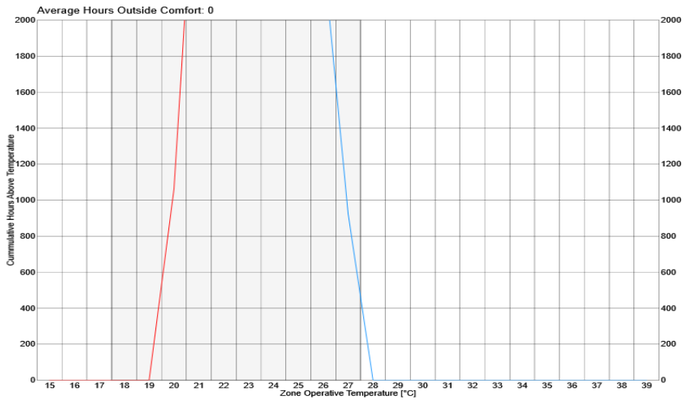
Graph 102 - EnergyFlowindicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 103 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

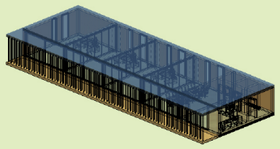


Graph 104 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 105 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

OFFICES OPTIONEERING 1



SITE EUI kWh/ m2

49

EUI BASELINE kWh/ m2

284

€ /m2/ a

4

kg CO2/m2/a

27

SAVED vs BASELINE

83%

Program	Office
Use Type	Office + Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	5
Lighting Power Density	10
Illuminance Target (lux)	500
Dimming Type	STEPPED

ENVELOPE

Type	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.2

WATER

COP	2.5
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.58	0.163	0.291

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	3

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	3

MECH. VENTILATION

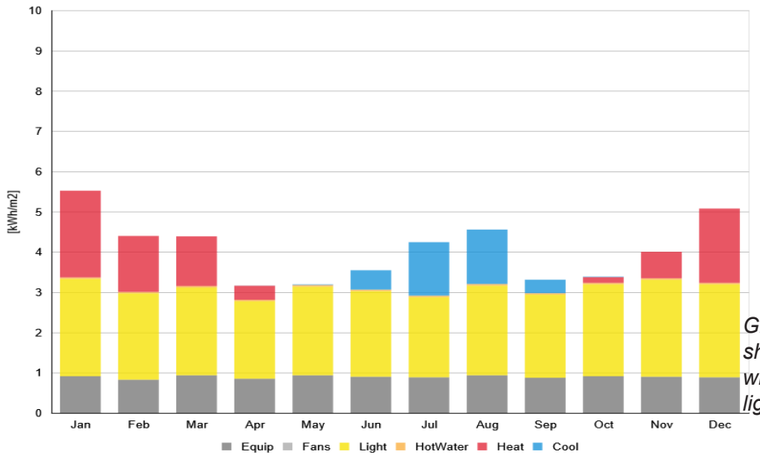
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

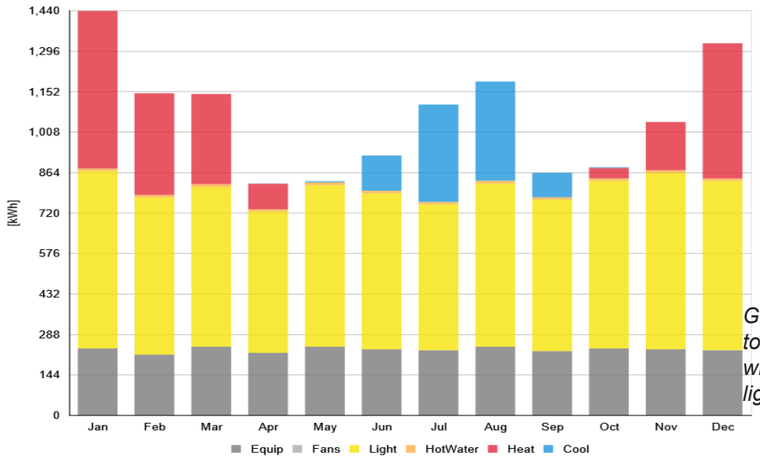
Flow Type	-
Nat Vent Set Point (•C)	-
Nat Vent Min Out Air Temp (•C)	-
Nat Vent Max Out Air Temp (•C)	-

OPTIONEERING 1

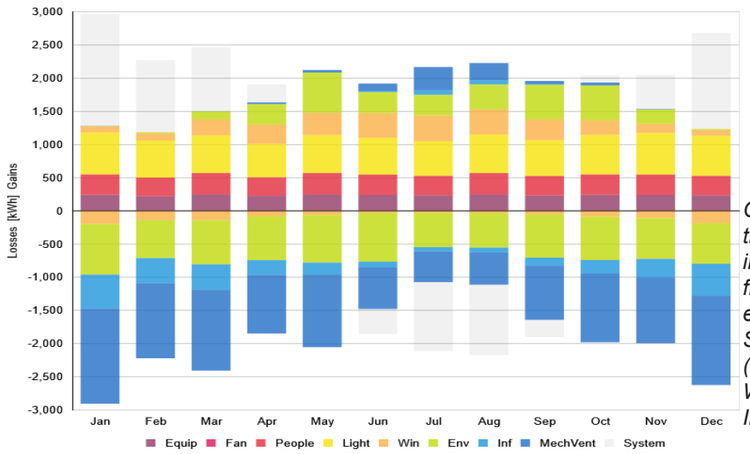
The parameters for this iteration of the offices were set as described. The performance parameters chosen were improved along with the addition of the shading systems contribute considerably to reducing site EUI to 49 kWh/m2.Lighting dimming type chosen was stepped to regulate ambiet lighting better and the infiltration coefficient improved in regards to a more airtight envelope. An air system of COP 3 was adopted and the glazing assembly improved .Natural ventilation schedules were not adopted for this iteration.



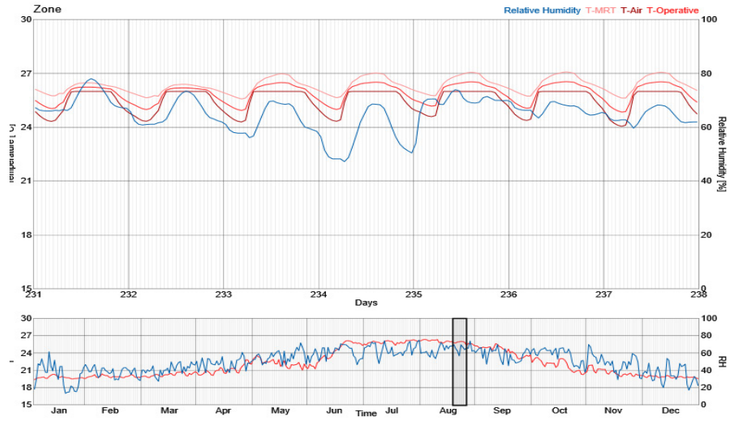
Graph 106 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



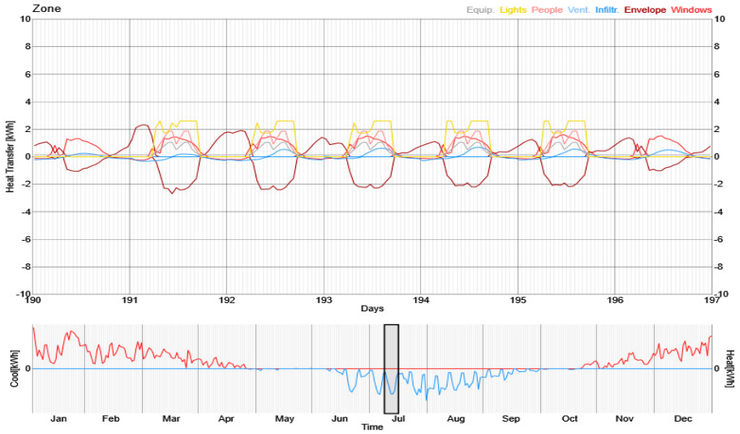
Graph 107 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



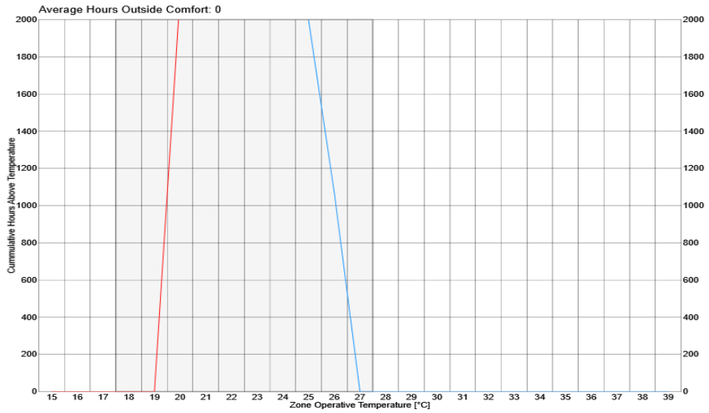
Graph 108 - EnergyFlowindicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



Graph 109 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.

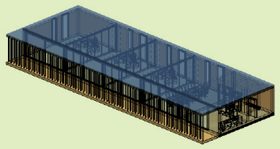


Graph 110 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.



Graph 111 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

OFFICES OPTIONEERING 2



SITE EUI kWh/ m2

39

EUI BASELINE kWh/ m2

284

€ /m2/ a

3.5

kg CO2/m2/a

21

SAVED vs BASELINE

86%

Program	Office
Use Type	Office + Mixed Use
People Density (P/m2)	0.0714
Metabolic Rate (met)	1.2
Occupancy Schedule	occLectureHall
Airspeed Schedule (m/s)	Airspeed 0
Clothing (clo)	ASHRAE 55 Dynamic Clotheing Model
Equipment Power Density (W/m2)	5
Lighting Power Density	10
Illuminance Target (lux)	500
Dimming Type	Continuous

ENVELOPE

	U Value (W/(m2K)	Thermal Capacitance (kJ/K/m2)
Roof	0.128	300.305
Facade	0.259	110.108
Ground Slab	0.305	965.857

Infiltration Ach (ACH)	0.2

WATER

COP	2.5
Inlet Water Temperature (•C)	10
Water Supply Temberature (•C)	30

GLAZING

Type	U Value (W/(m2K)	SHGC	TVIS
Triple Glazed	0.57	0.216	0.512

t

HEATING

Heating Setpoint (•C)	20
Max Heat Supply Air Temp (•C)	30
Heating Limit Type (enum)	No Limit
Max Heating Capacity (W/m2)	100
Max Heat Flow (m3/s/m2)	100
Heating COP	3.5

COOLING

Cooling Setpoint (•C)	26
Min Cooling Supply Air Temp (•C)	18
Cooling Limit Type (enum)	No Limit
Max Cooling Capacity (W/m2)	100
Max Cool Flow (m3/s/m2)	100
Cooling COP	3.5

MECH. VENTILATION

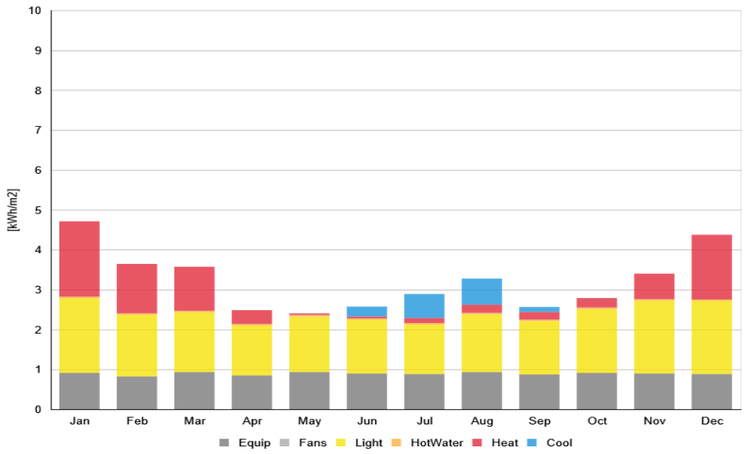
Min Fresh Air Person (L/s/p)	8.3333
Min Fresh Air Area (L/s/m2)	4.1667
Heat Recovery Type (enum)	Sensible
Heat Recovery Efficiency Sensible	0.6
Heat Recovery Efficiency Latent	0.65
Economizer Type (enum)	No Economizer

NAT. VENT

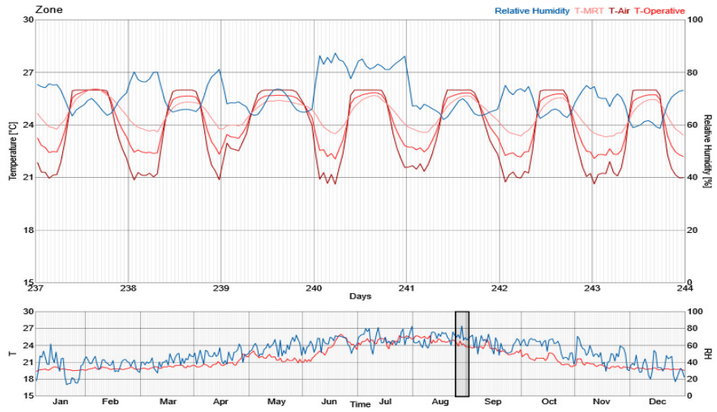
Flow Type	Buoyant
Nat Vent Set Point (•C)	22
Nat Vent Min Out Air Temp (•C)	0
Nat Vent Max Out Air Temp (•C)	30

OPTIONEERING 2

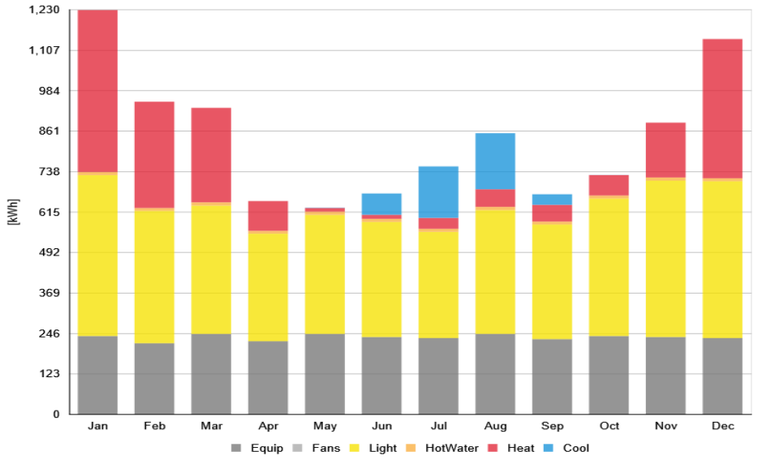
The parameters for this iteration of the office were set as described. The performance parameters chosen were further improved considerably reducing site EUI from 49 kWh/m2 to 39 kWh/m2. Lighting dimming type chosen was set to continuous to regulate ambiet lighting in the most efficient manner and provide the office space with customized illuminance levels as preferred and the infiltration coefficient slightly improved to 0.2 for airtight envelope to offset further energy losses. A ground heat exchanger with efficiency of 3.5 was adopted and the glazing assembly improved. Natural ventilation schedules were adopted for this iteration with an airflow network simulated by the software.



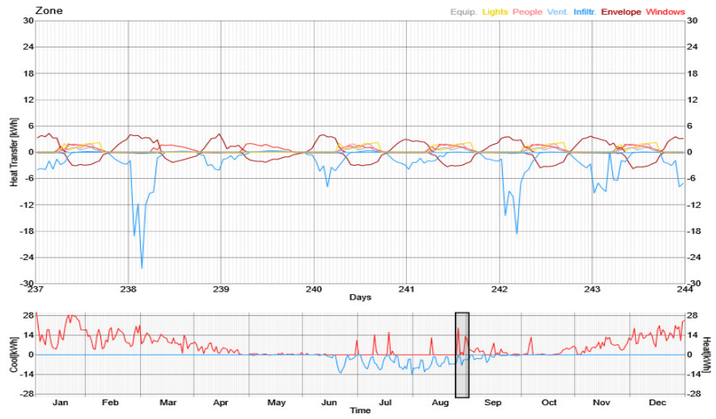
Graph 112 - Energy Use Intensity shows monthly EUI levels for the whole building for heating, cooling, lighting and equipment.



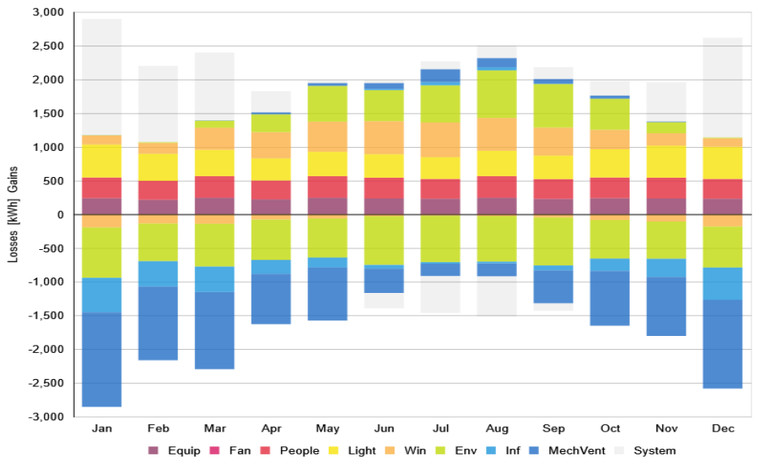
Graph 115 - At the zone level, the graph reports hourly dry bulb, mean radiant and operative temperature as well as relative humidity at the center of a zone for a chosen day in the annual year.



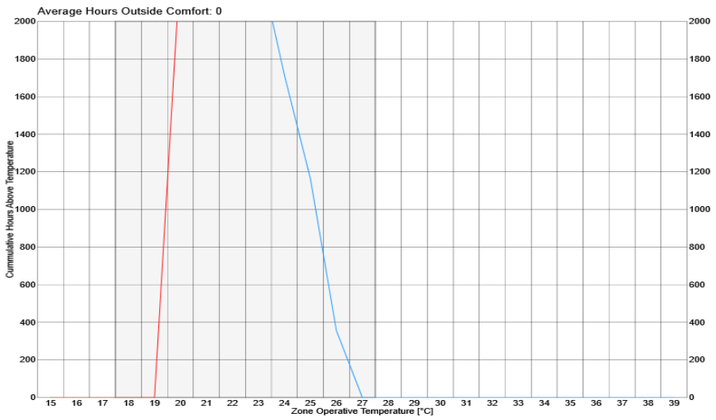
Graph 113 - Energy Use shows total monthly energy use for the whole building for heating, cooling, lighting and equipment.



Graph 116 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling).zone for a chosen day in the annual year as seen in the graph.

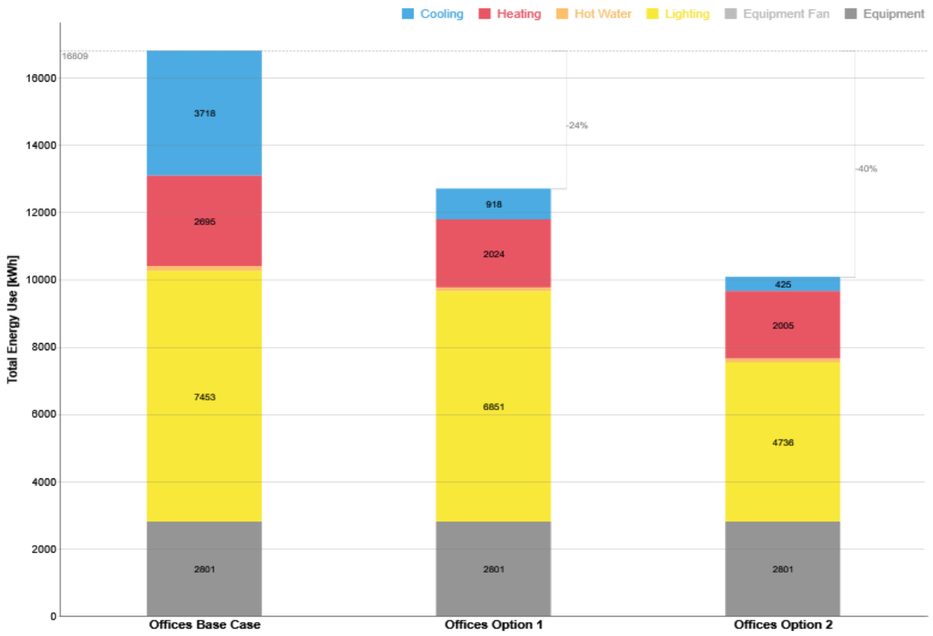


Graph 114 - Energy Flow indicates the monthly sum of heat flows in and out of the zone. Heat from equipment, people and electric lighting is always positive. System loads may be positive (heating) or negative (cooling). Win - windows, Env - envelope, Inf- infiltration



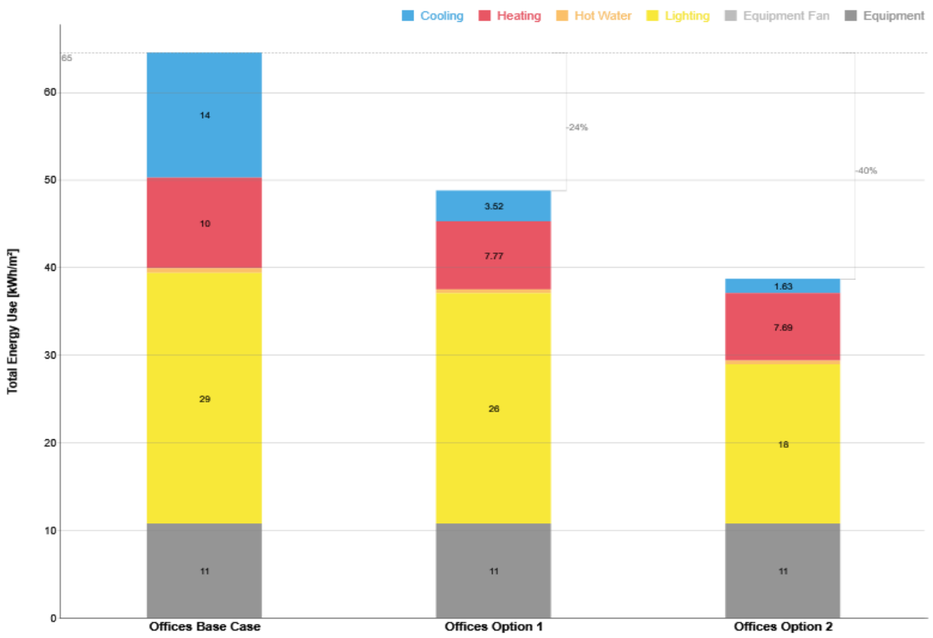
Graph 117 - Zone Temperature Curves show the number of hours for each zone that the operative temperature is below (red) or above (blue) a given temperature.

SELECTED ITERATION FOR ENERGY AND THERMAL COMFORT : OPTIONEERING 2

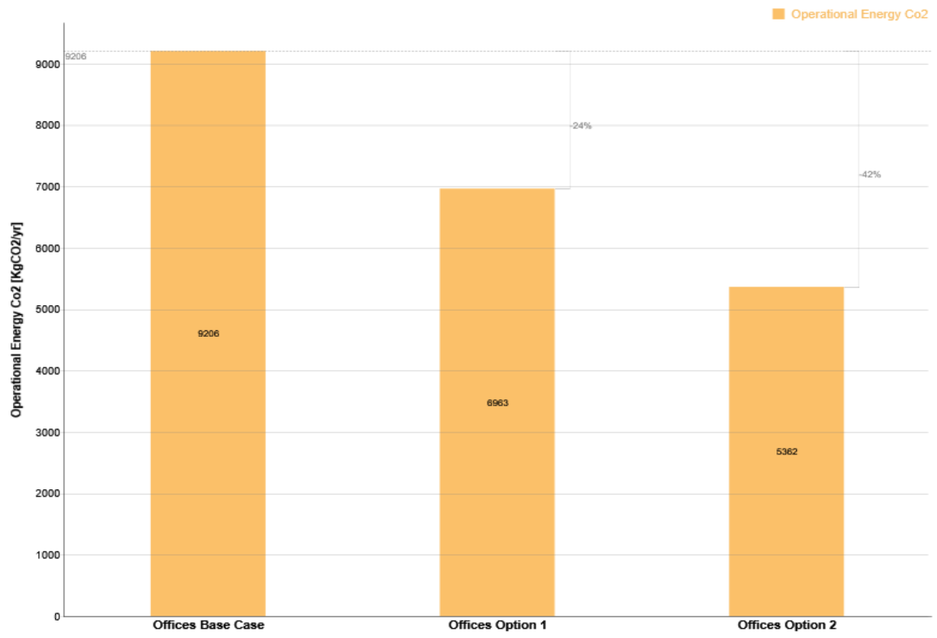


Graph 118 - EUI comparison: Optionneering 1 & 2 vs Baseline.

Graph 120 - Energy Flow comparison: Optionneering 1 & 2 vs Baseline.



Graph 119 - Total Energy Use comparison: Optionneering 1 & 2 vs Baseline.



Graph 121 - Operational Energy CO2 (KgC02/yr): Optionneering 1 & 2 vs Baseline.

ANALIZA E PAMJES LEED

LEED VERSION 4.1 QUALITY VIEWS

Quality Views is a set of standards used to evaluate the effectiveness of a building's design to provide building occupants with substantial and beneficial views. The project was analyzed for the following criteria.

TOTAL QUALITY VIEWS

Total percentage of floor area that has a quality view is a location possessing both Type 2 and Type 3 views.

To qualify for a credit, at least 75% of the regularly occupied building floor area must have a Quality View.

TYPE 1 - 90° SIGHT LINES

Multiple lines of sight to vision glazing in different directions at least 90 degrees apart.

TYPE 2 - SKY AND CONTEXT

Views that include at least a view of the sky and objects at least 25 feet (7.5 meters) from the exterior of the glazing.

TYPE 3 - UNOBSTRUCTED VIEW

Unobstructed views located within a distance of three times the head height of vision glazing.

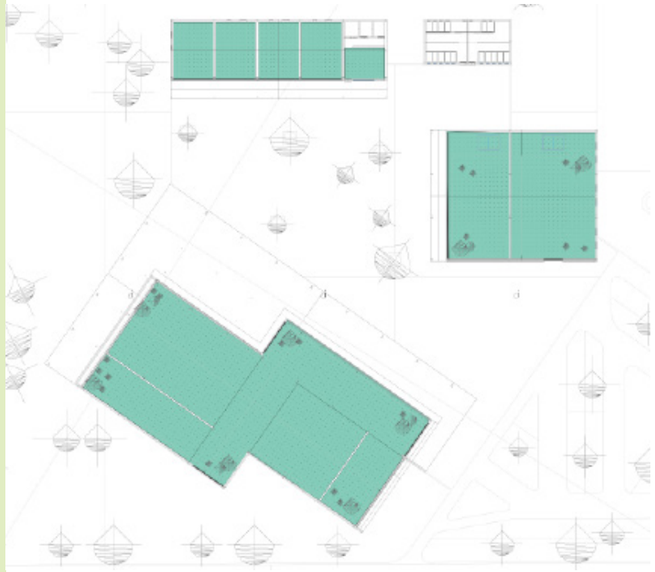


Figure 203 - Type 2 Quality

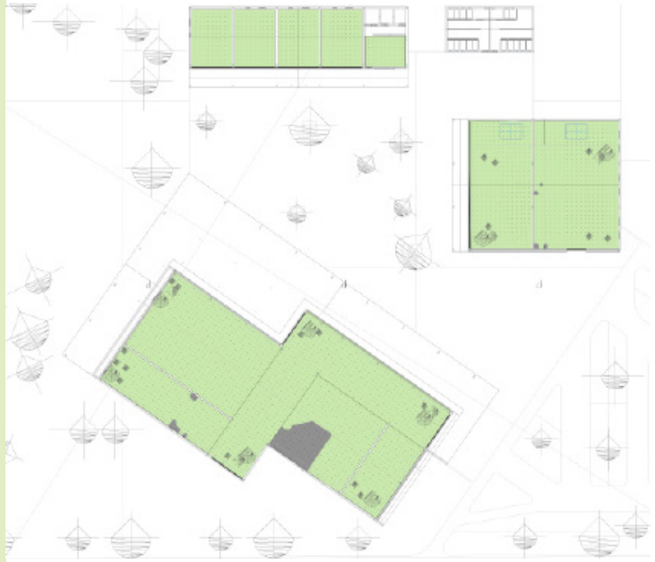


Figure 204 - Type 3 Quality

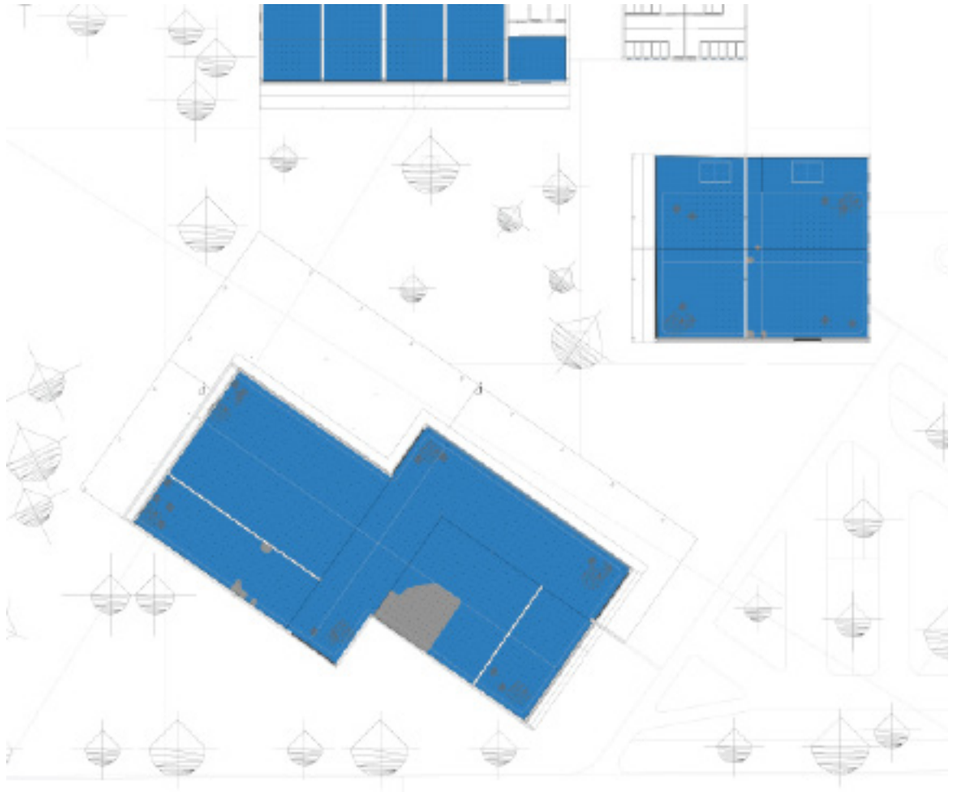


Figure 205 - Overall Quality

CREDITS	QUALITY	TYPE 2	TYPE 3
1	97.1%	100%	97.1%

THE LIFELINE & QUALITY VIEWS

Designing for quality views involvesd consideration of building orientation and site design, facade, and interior layout. In particular, the Resilience Hub and Community Hall considered the surrounding environment of forest and beach in proximity to the urban area for an integrated design that enabled LEED certification.

Building occupants who can visually connect with outdoor environments while performing everyday tasks experience greater satisfaction, attentiveness, and productivity. Workers seated at computers, who often develop eye strain or dry eyes from looking at their screens for extended periods without a break, find relief in attractive distance views.

Views of the outdoors also connect the occupants with natural environmental cues, such as diurnal changes from light to dark and the changes in light from season to season, which is important for maintaining natural circadian rhythms. Disruption of these rhythms can lead to long-term health care problems, including mental disorders.

The architectural design and layout considers the aforementioned criteria strongly.

SHIKO ANALIZËN EN 17037

EN 17037 VIEW OUT ANALYSIS

The new European Standard EN 17037 deals with daylight in buildings. Published at the end of 2018, it is the first Europe-wide standard to deal exclusively with the design for, and provision of, daylight.

EN 17037 replaces a patchwork of standards across different European countries or provides one where no existing standard is present.

Daylight is important for the health and wellbeing of building users, for providing sufficient illumination to carry out tasks, and for giving a connection with the outdoors. Providing appropriate levels of daylight also helps in saving energy, by not having to rely on artificial lighting as often.

The compliance levels are based on three assessments, which are carried out for every view position:

HORIZONTAL SIGHT ANGLE

The total horizontal angle (in the XY-pane) subtended by windows from the viewing position. Achieving Minimum compliance requires an angle of at least 14 degrees. Medium and High levels of compliance require angles of 28 and 54 degrees respectively.

OUTSIDE VIEW DISTANCE

The median view distance from the window to objects seen outside the window. Thresholds for Minimum, Medium, and High levels of compliance are 6, 20, and 50 meters. The median is assessed using all pixels containing through-window views to the outside from the viewing position. The sky and un-modeled portions of the ground hemisphere are considered to be infinitely distant, so if these elements compose more than half of the outside view, the median distance will also be infinite.

NUMBER OF VIEW LAYERS

Number of View Layers: EN 17037 defines three view layers: Sky, Ground, and Landscape. The Landscape layer includes both natural elements and buildings – in other words, everything except sky and man-made ground. A view position must see at least the Landscape layer in order to achieve Minimum compliance. Medium compliance requires seeing the Landscape layer plus one other. High compliance requires seeing all three.

The overall compliance level for each view position is the worst performer among the three criteria above.

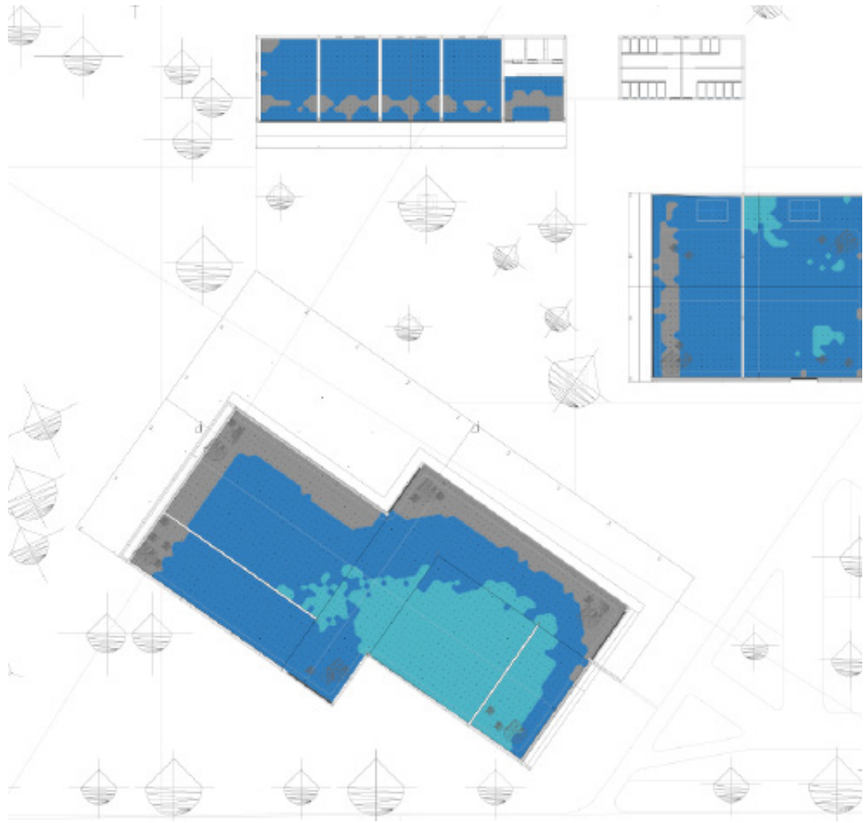


Figure 206 - BUILDING WIDE VIEW LEVELS (% Floor Area)

FAIL	MIN	MAX	HIGH
16.8%	65.0%	18.2%	0.0%

ENERGJIA PV

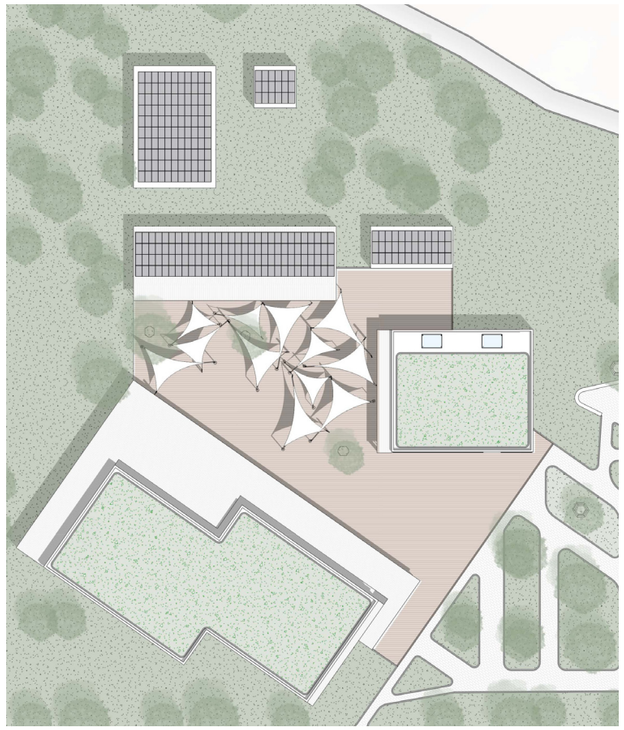
PV ENERGY PRODUCTION

Climate change remains a foremost concern in global politics, economics, and scientific research, particularly as it pertains to the architecture and construction industries. This heightened culpability for the field of architecture stems from the fact that the construction industry contributes to 40% of global emissions, and the demand in the building sector is only projected to increase by 70% by 2050. Renewable energy is part of a 21st-century sustainability paradigm that responds to climate change and environmental degradation, strengthening the momentum for global energy transformation.

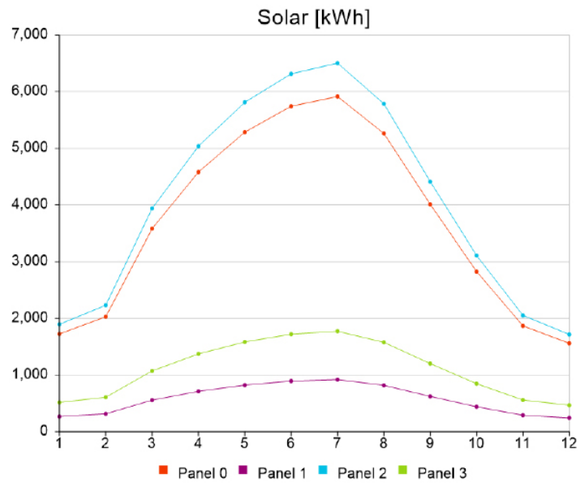
Renewable energy production strategies are necessary to mitigate future energy security issues as traditional sources of fuel become increasingly scarce, and an indispensable part of designing for sustainability in architecture.

For the orientation of the PV panels we chose to follow then plan disposition as a guideline, with this orientation of the panels, the best angle for the tilt is 0°. Also this inclination of them provide the possiblllty to place maximum panels closer to each other.

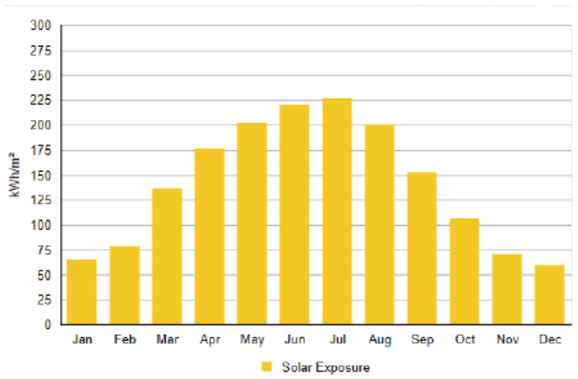
Author



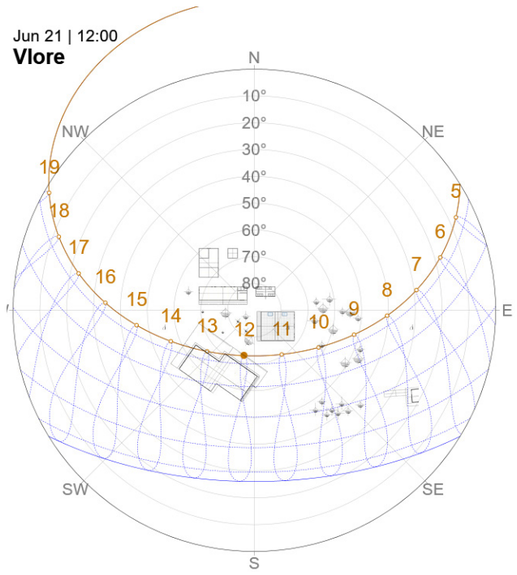
The plan shows the chosen location of mounting the PV System.



Graph 123 - PV Generation Output



Graph 124 - Annual Solar Exposure 1994 kWh/m2/year



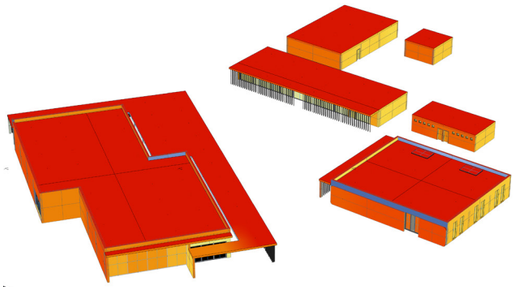
Graph 122 - The sun path for the site determined the optimum placement of the PV System.

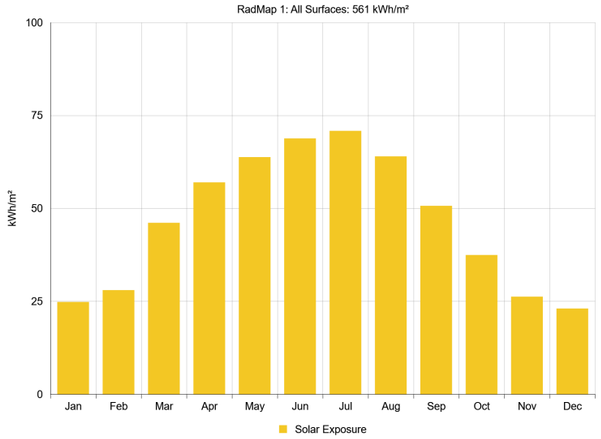
PHOTOVOLTAIC MODULES
SUN ORG ITALIA
X-MAX XL 340 WP BLACK WHITE
Monocrystalline Cells
Efficiency 19.78%

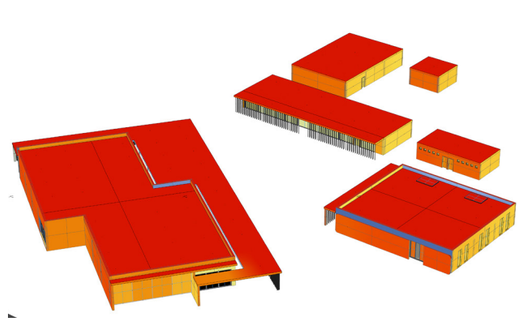
Annual Solar Radiation 1994 kWh/m2/yr
Site EUI 50 kWh/ m2
Panel Efficiency 19.78%
Inverter Efficiency 96%
Projected Energy Use 38000 kWh
PV Contribution 63%, 24115 kWh

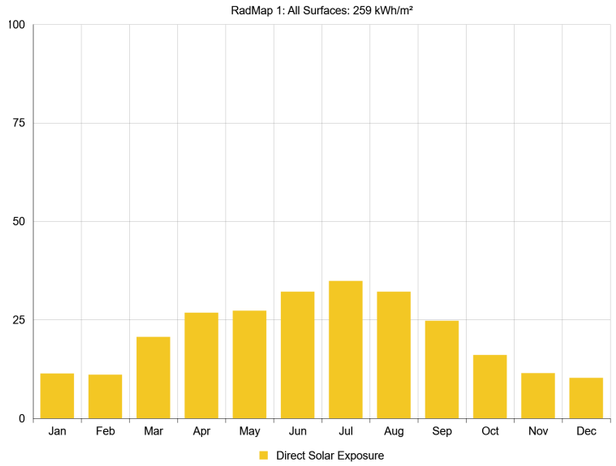
RREZATIMI TOTALI

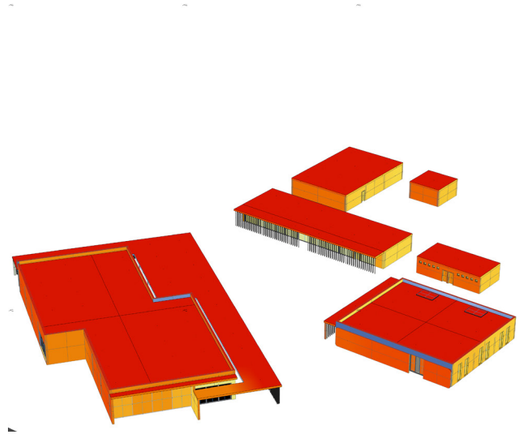
RADIATION MAP

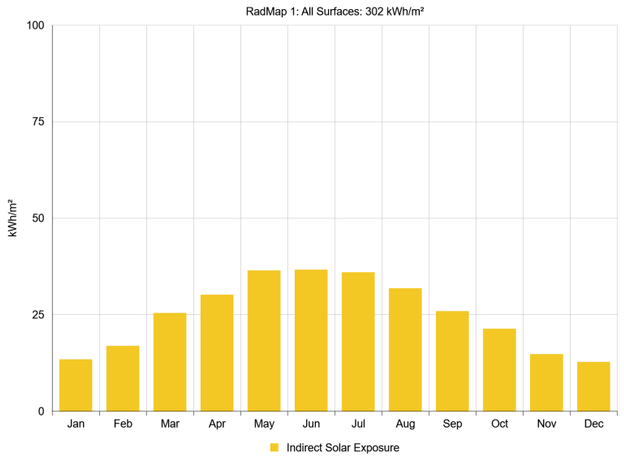












9. IMM Retrofitting

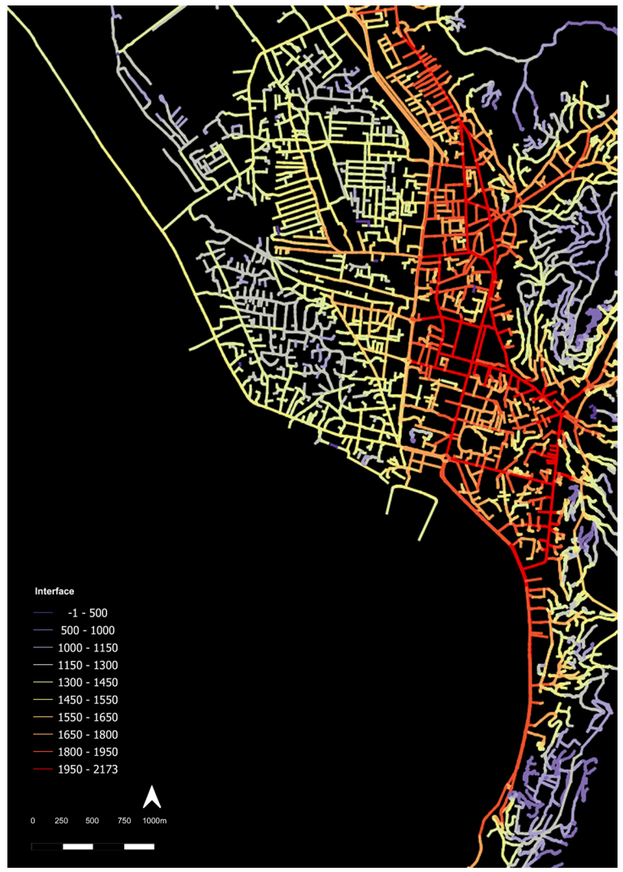
ANALIZA VERTIKALE

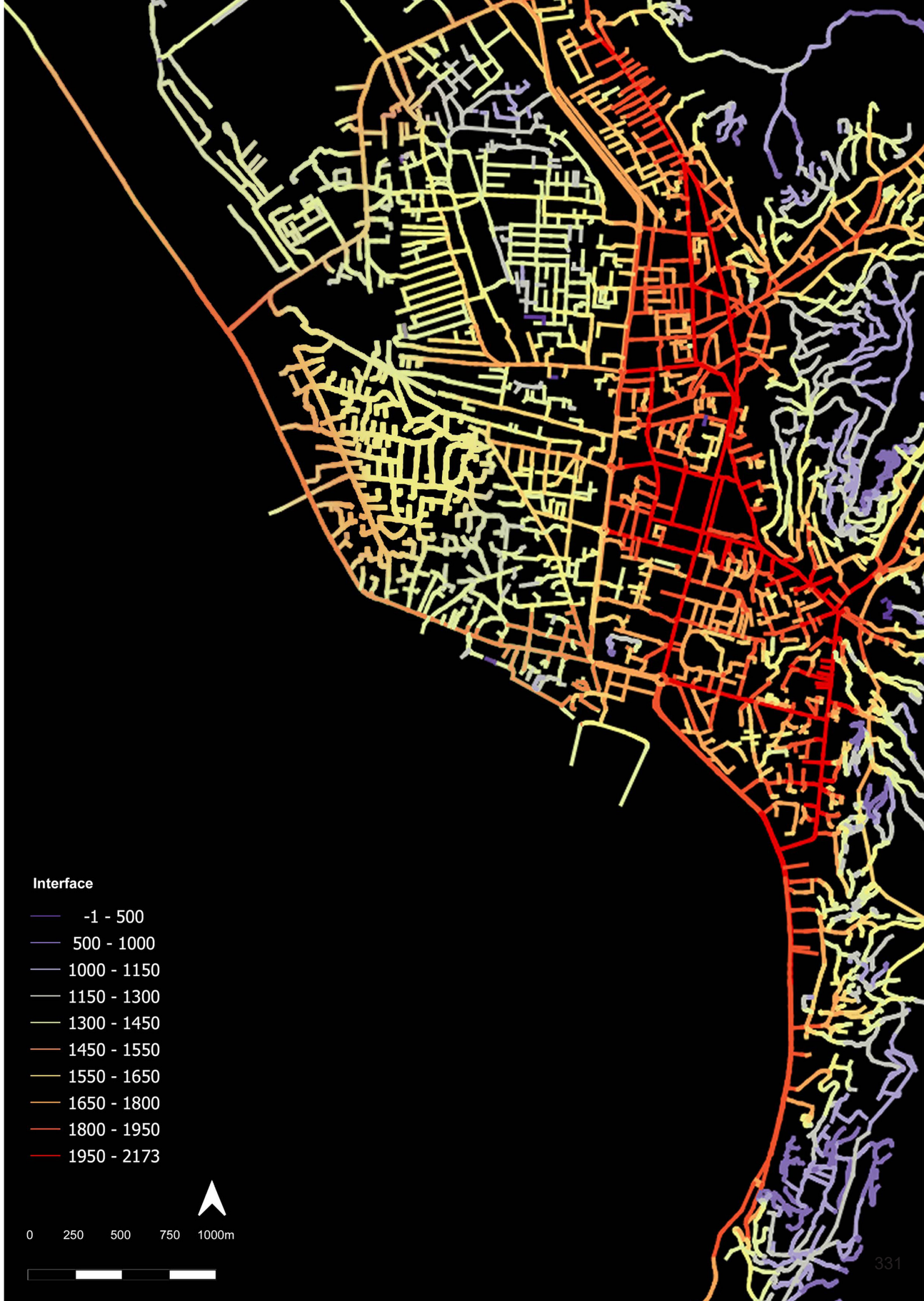
9.1

INTERFACE

The interface maps with the interventions made in the earlier stages shows an improved connectivity in the western segment of the city owing to the develoipment of the intermodal hub and the hubs in the forest. Warmer tones of yellow and orange hues are observed in the previously blue and disconnected portion.

Description & Map by Author





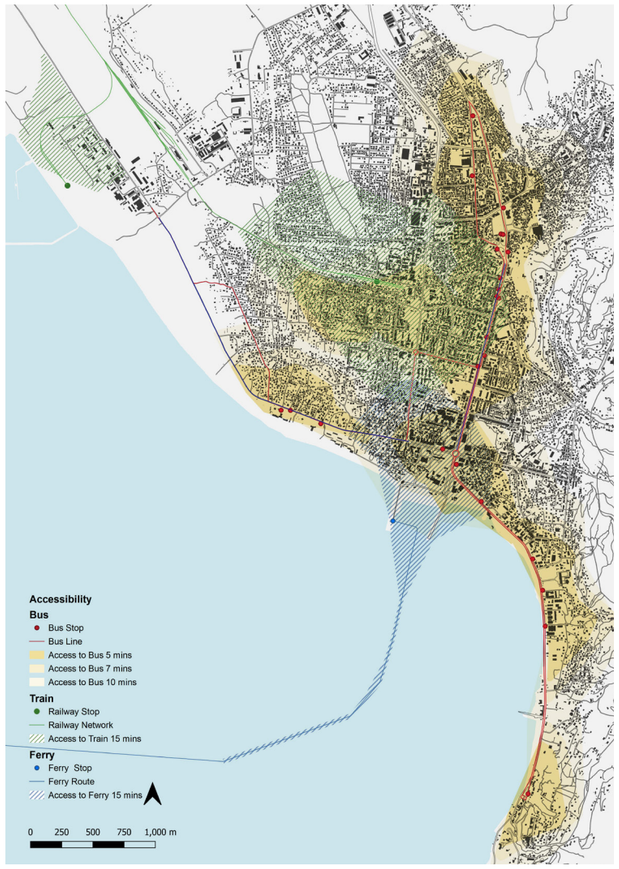
ANALIZA VERTIKALE

9.1

ACCESSIBILITY

The addition of bus stops, intermodal hub along the disconnected western portion of the city now stands improved. A significant improvement is also observed in the northern part of the city. The access to the proposed projects and the Soda forest is also introduced to a previously neglected part of the city.

Description & Map by Author



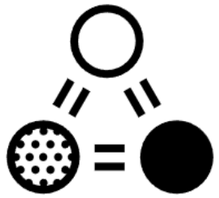
ANALIZA VERTIKALE

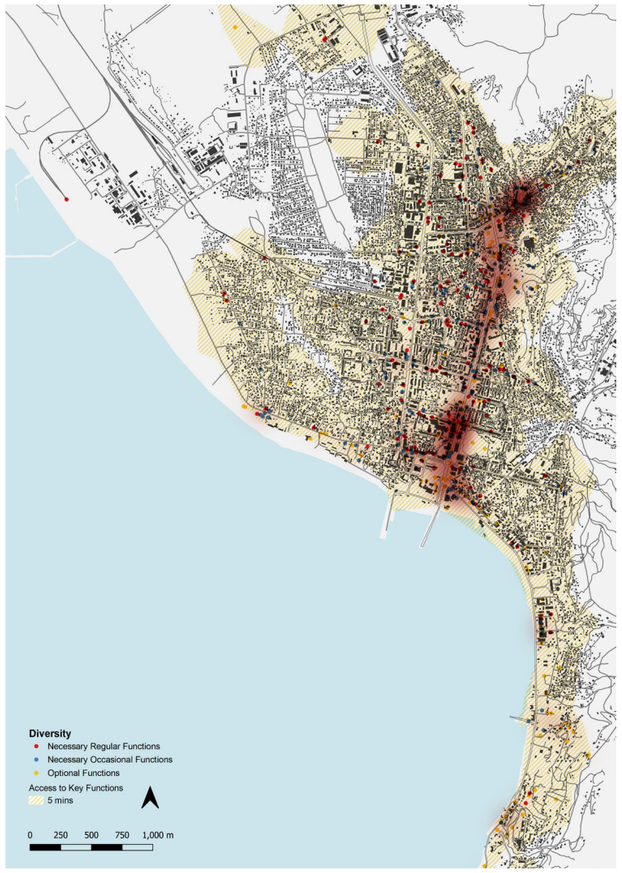
9.1

DIVERSITY

The addition of bus stops, the proposed project and the intermodal hub will have a significant impact and activates the previously isolated and ignored portion of the city in the western sector. The introduction of new functions in the Soda forest would act further as a catalyzer for even more functions to be added to the area thereby continually improving the performance.

Description & Map by Author





ANALIZA VERTIKALE

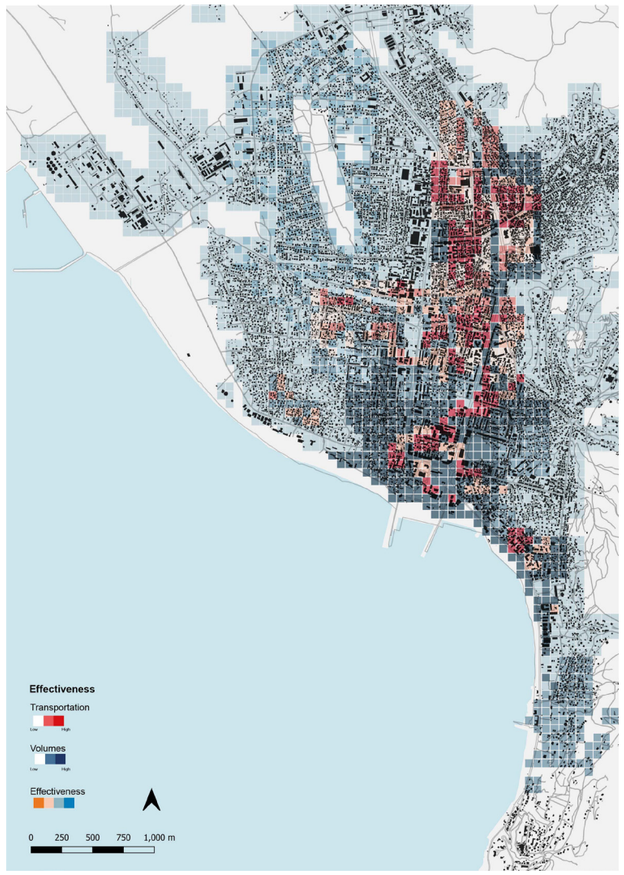
9.1

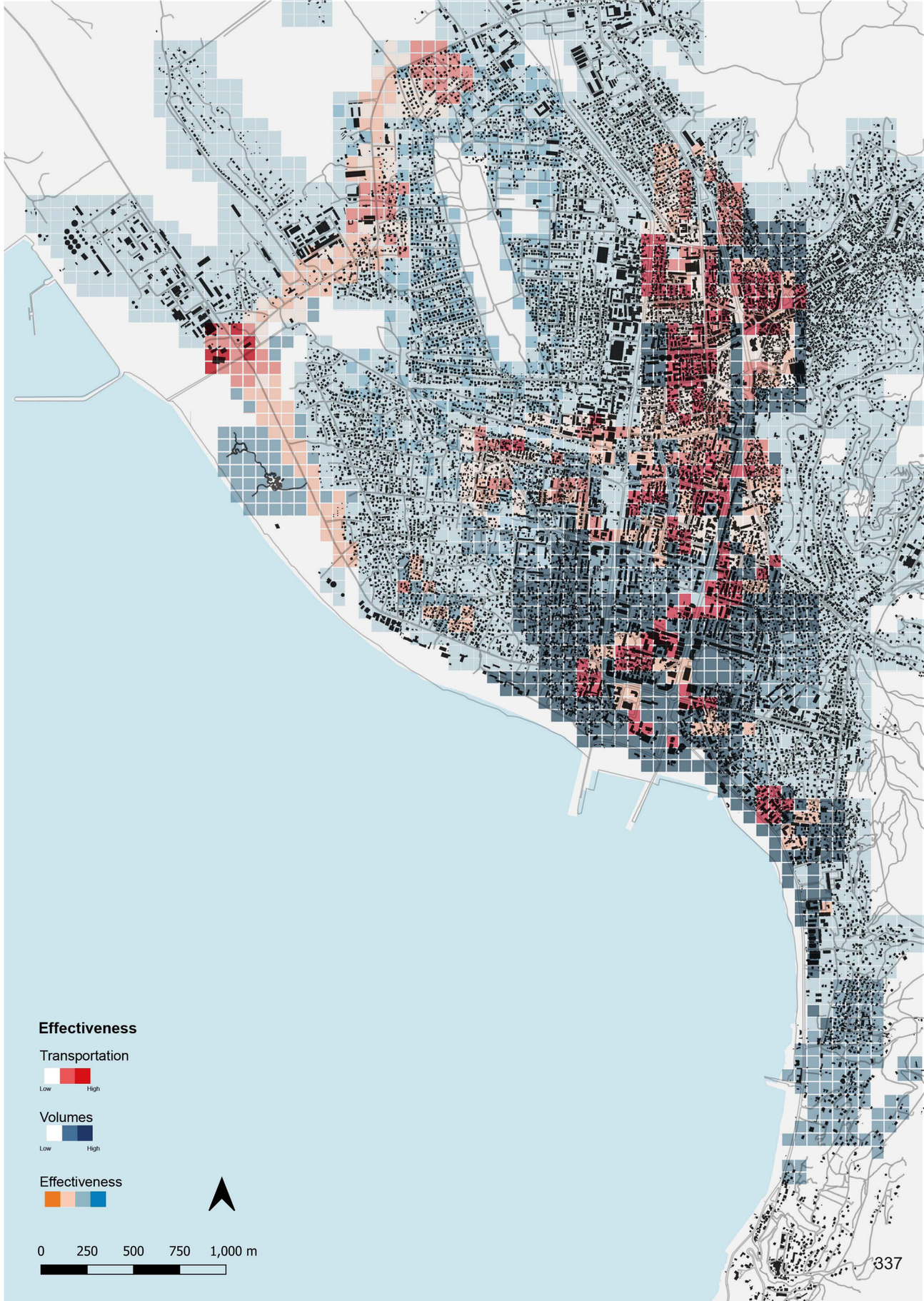
EFFECTIVENESS

The addidion of the proposed projects in the Soda forest alters the transport network significantly also owing to the introduction of bus stops and the intermodal hub.

The previously stagnant Soda forest now is activated in conjunction with the transport access including the extension of the bike path. The warmer red tones indicate a successfull activation of a previously stagnant western sector .

Description & Map by Author





ANALIZA VERTIKALE

9.1

LINKS

The introduction of additional bus stops at strategic nodes analyzed, the intermodal hub and the extension of the bike path has improved the overall connectivity and integrates the urban city with its diverse ecosystems.

Description & Map by Author

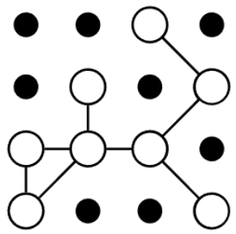
ANALIZA VERTIKALE

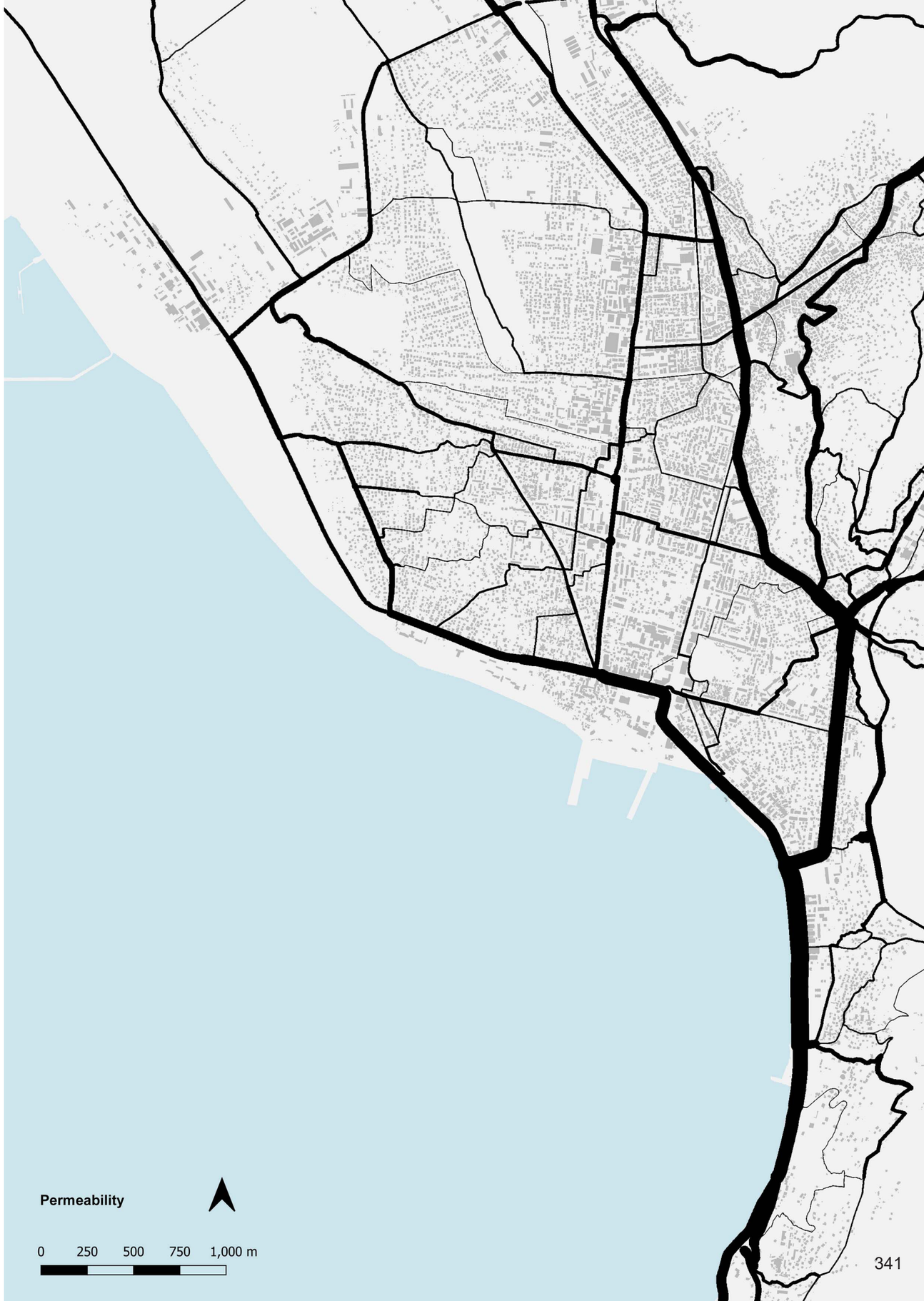
9.1

PERMEABILITY

The addition of proposed functions along the Soda forest has led to the reinforcement of the existing road network which can be observed in the maps.

Description & Map by Author





ANALIZA VERTIKALE

9.1

POROSITY

The most obvious form-related quality that identifies and differentiates the spatial qualities is the volume/void arrangement. The maps show that the core section of Vlore is dense and remains largely unchanged, but development is seen in the Soda forest and at the site of the intermodal and resilience hubs.

Description & Map by Author

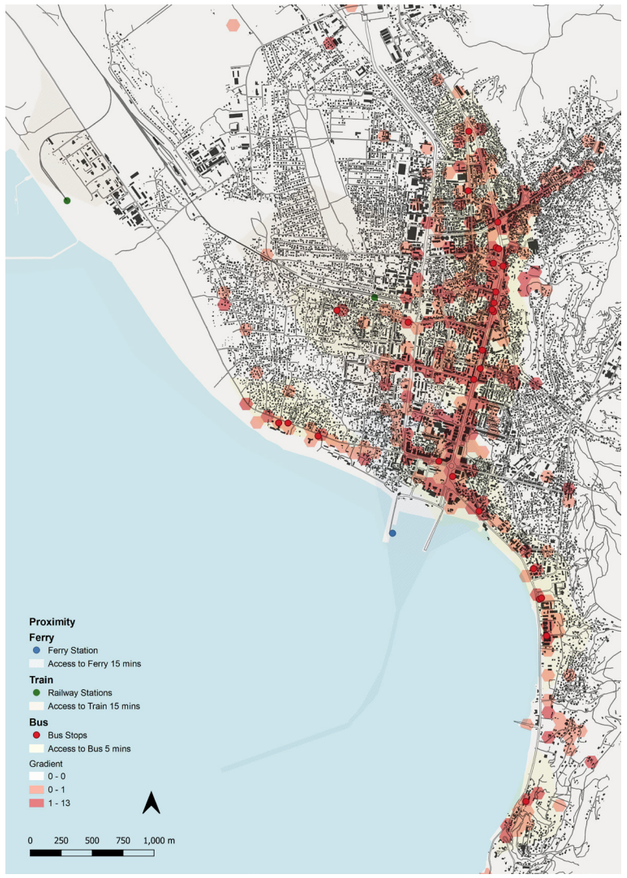
ANALIZA VERTIKALE

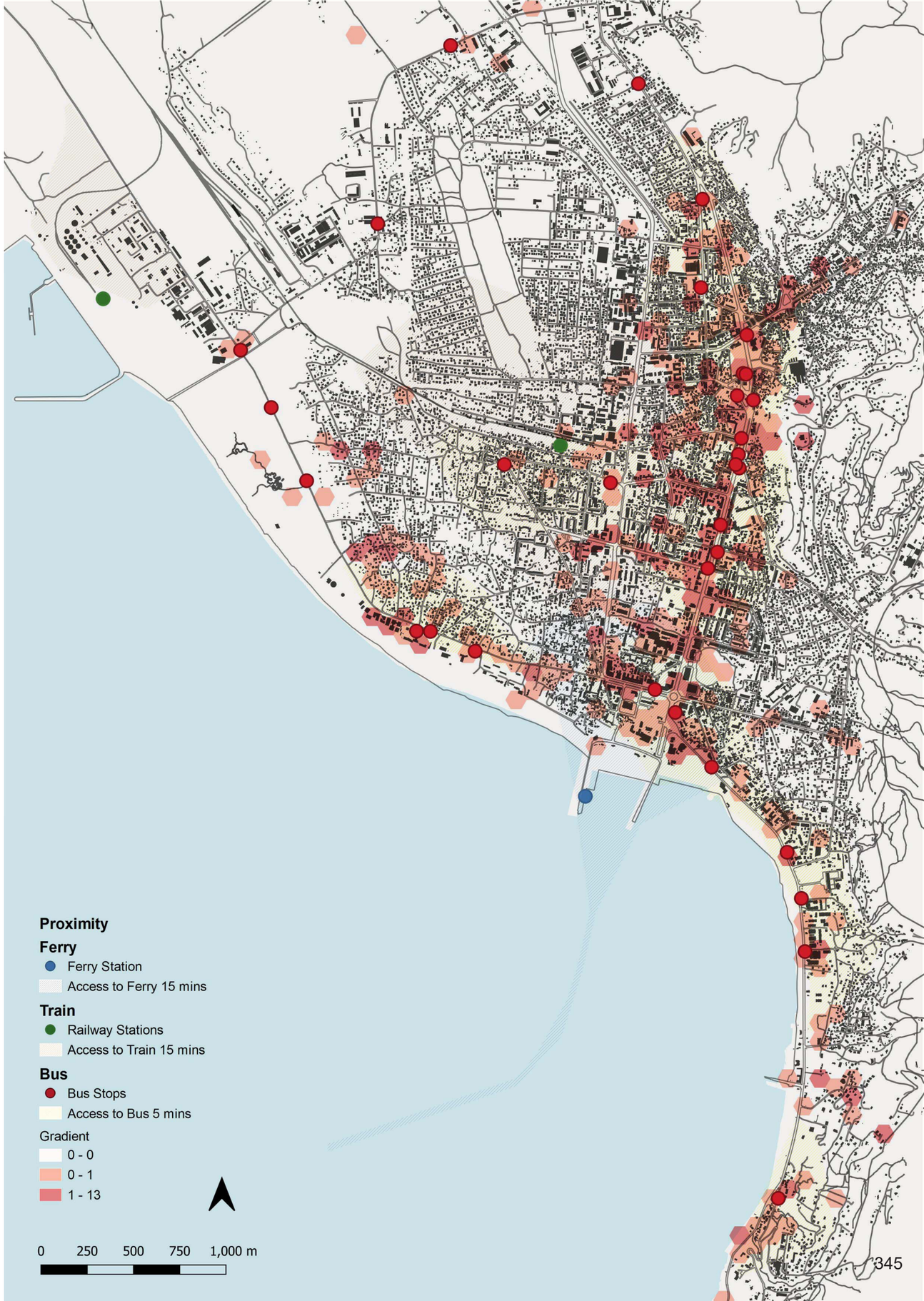
9.1

PROXIMITY

The access to transportation infrastructure is mainly centered along the main boulevard and remains unchanged. However, the introduction of bus stops at strategic nodes, the development of the recreational hubs in the forest, and the proposal of the resilience and intermodal hubs in the western portion of the city has improved the performance of the city.

Description & Map by Author





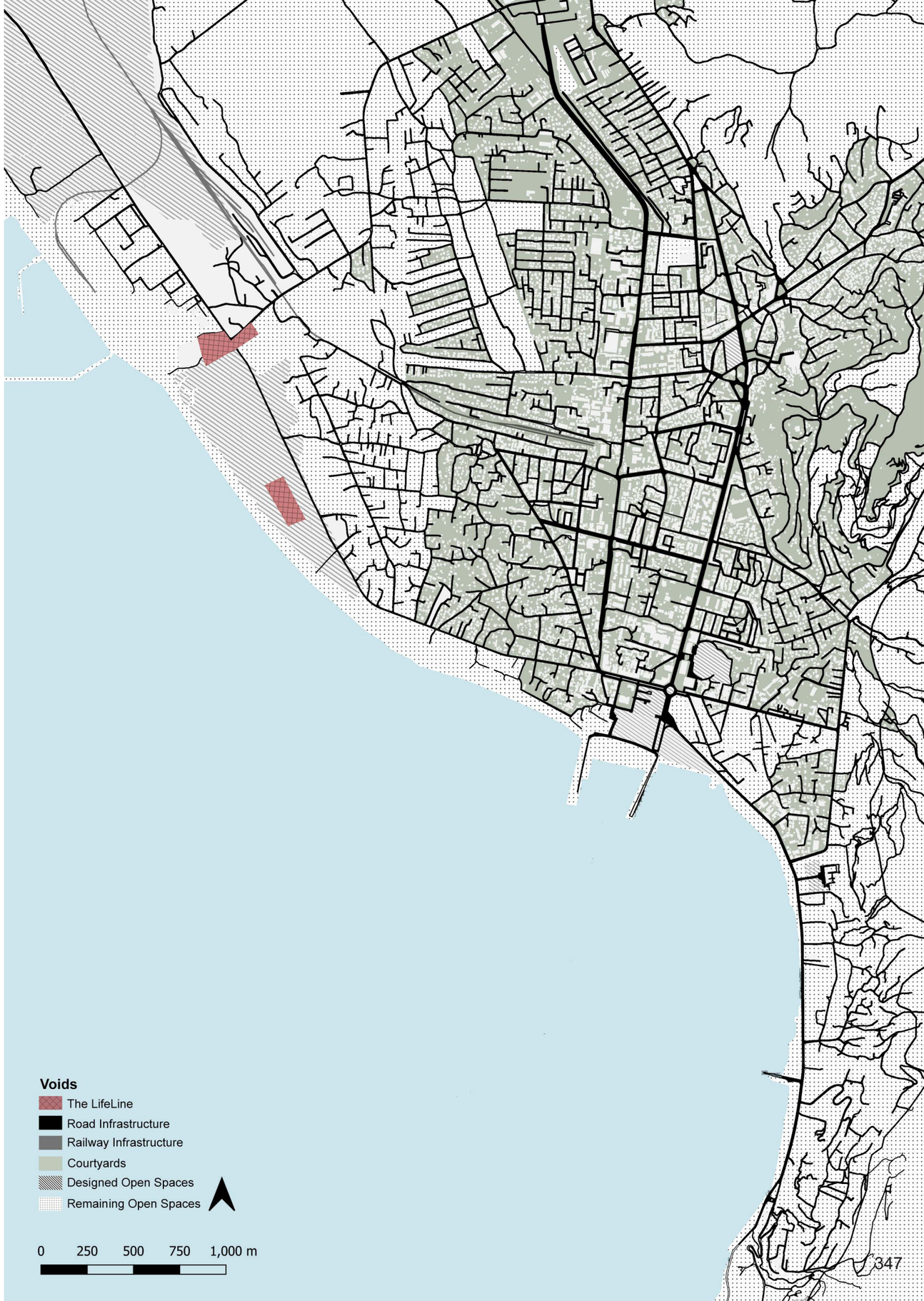
ANALIZA HORIZONTALE
9.2

VOIDS

The void analysis showcases open spaces spread through out the urban fabric of Vlore. A distinction between both designed and other open spaces was made. The voids as seen in the map imply a complex voids often disconnected with eachother.

The reforestation strategy and measures at the site of the resilience and intermodal hubs would discourage further encroachment of the area thereby preserving the value and quality of the protected area.

Description & Map by Author

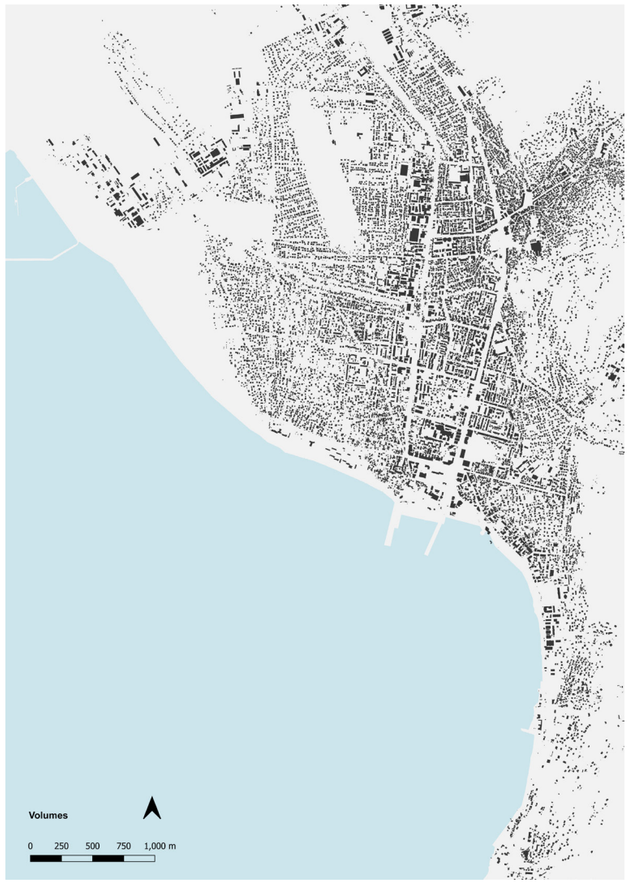


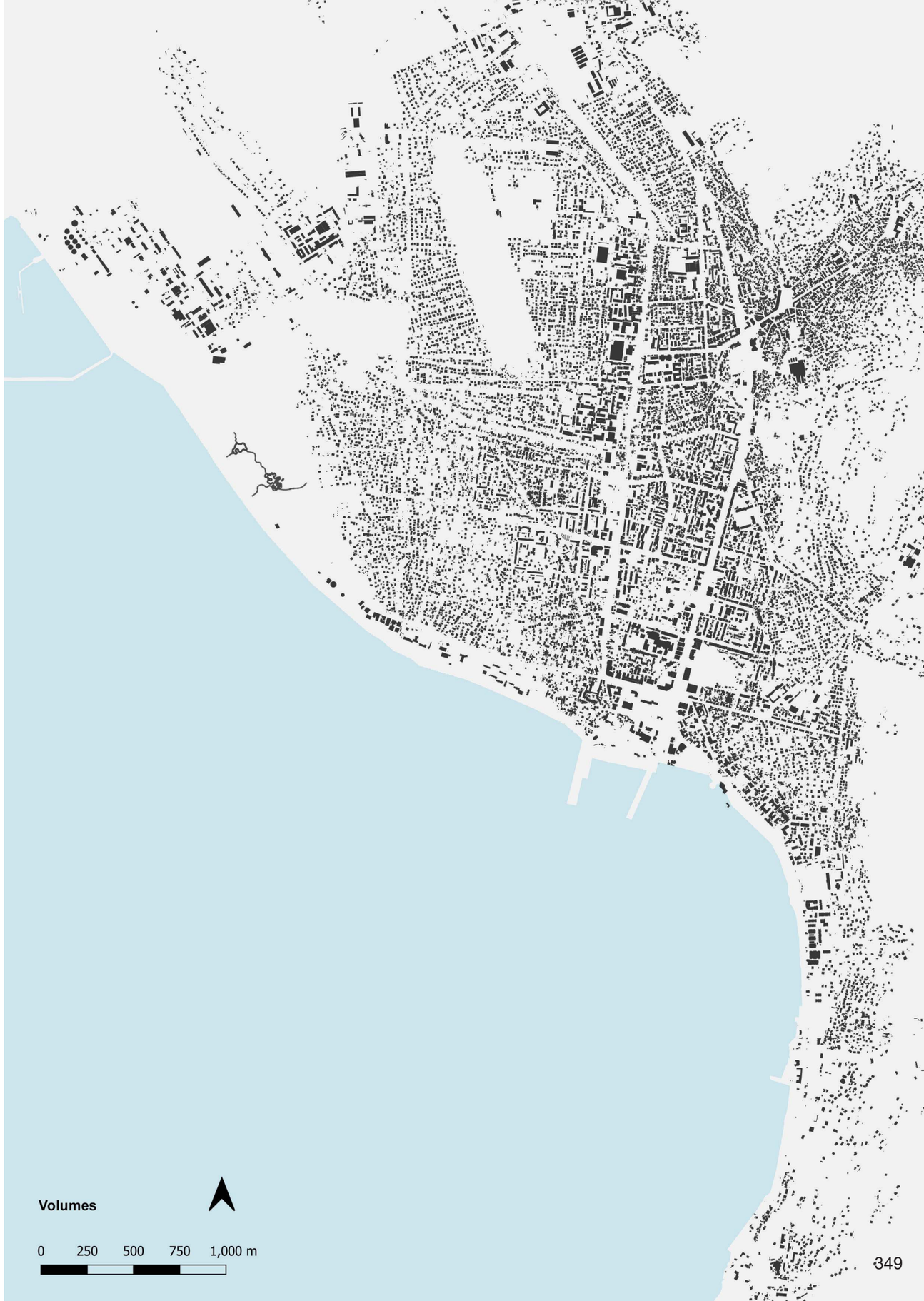
ANALIZA HORIZONTALE
9.2

VOLUMES

The retrofit map showcases the addition of the interventions and designed projects in the Soda forest. The other volumes remain unchanged.

Description & Map by Author



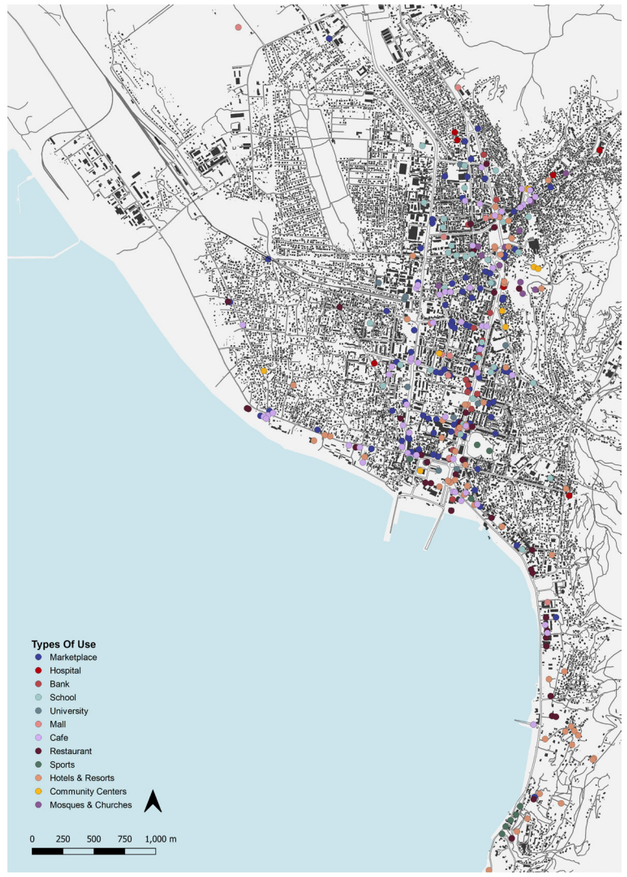


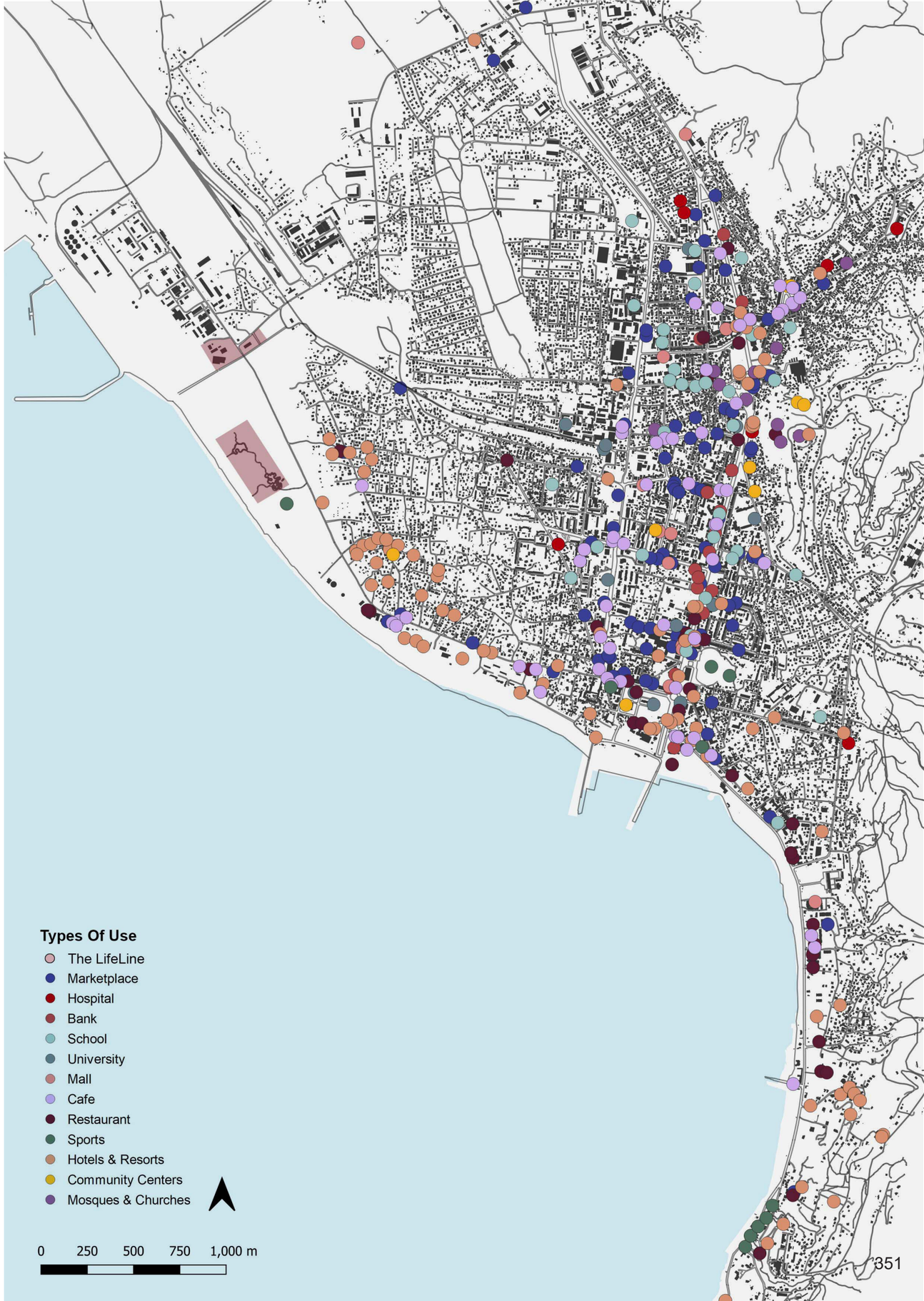
ANALIZA HORIZONTALE
9.2

TYPES OF USE

The distribution of the functions in the city is directly relatable to the density of the volumes. As seen in this case study, functions are located on the main artery of Vlora, the Ismail Qimali boulevard. The interventions and project proposal made along the western sector of Vlore in the Soda forest adds to the array of functions available for the city and will also welcome more investment and potential projects in the area thereby successfully activating and integrating the city.

Description & Map by Author





RETROFIT - TABLE OF INDICATORS

Indicators	Actual CAS Performance Output	Updated CAS Performance Output
1. Ground Use:		
a) Urban Built density. Building Volume Density (BVD)	7.748	7.730
b)11.3.1 Ratio of land consumption rate to population growth rate	-129.00	-129.00
c) Number of buildings per hectare	22.896	22.900
d) Number of inhabitants per hectare	156.396	156.396
f) land cover change in a given area %	10.318	10.330
g) Albedo surface fraction	0.2	0.2
h) Solar energy potential of a given area	4.1	4.1
i) Block Density	0.552	0.552
m) Land cover in a given area	0.97	0.98
3. Multiplicity and Variety:		
a) Ratio between numbers of residents and activities*	8530.68	8530.68
b) Housing diversity* (%)	0.11	0.11
d) Ratio of place dedicated to Innovation and Knowledge* (%)	2.5	2.5
4. Urban biodiversity:		
d) Number of native Plants	900	900
e) Number of native birds	323	323
f) Number of native butterflies	173	173
g) Number of native species	150	150
h) How prevalent are invasive alien species	196	196
l) Number of different natural ecosystem found in the city	6	6
5. Green Spaces:		
a) a) Lawn Cover Ratio (LCR)	2939.96	2963.59
b) Extent and number of parks (%)	0.0025	0.0050
c) Percentage of trees in the city in relation to city area	6.37	7.69
d) Land Surface Albedo (LSA)	0.2	0.2
e) Tree Cover Ratio (TCR):	86.977	87.100
6a. Cyclabilty:		
a) Length of biking roads (km)	0.000024	0.000026
c) Number of bike parking spots	0.000005	0.000006
d) Bike Sharing	1.000000	3.000000
6b. Walkability:		
d) Pedestrian street paths (%)	0.22	0.23
f) Number of Crosswalks	92	94
7a. Urban flow (people)		
l) Total number of journeys by public transport	17.6	18.0
n) Average length of a public transport trip	1.38	1.40
7b. Urban flow and mobility (Immaterial flow)		
a) Internet access	72.000000	72.000000
9. Energy management:		
b) Rate of energy coming from renewable sources* (%)	0.468777	0.487770
c) Renewable energy percentage in transport (%)	0.00000021	0.00000022
12. Water mangement*4:		
d) Total Annual Water Consumption	39000	3950
e) Produced urban wastewaters	6000	5950
i) Reused wastewater	15.38	15.40
n) Wastewater purified in a wastewater treatment plant*	6000	6000

KONKLUZIONI
9.3

Albania as a country seeks to transform itself into a modern and resilient nation and also aspires to be a European Union member. The various governmental entities of the country working togrther as a whole to reach prescribed benchmarks and standards is a way of achieving one of many ambitions for this remarkably historic nation.

The Lifeline would allow the local and international community, organizations with varied interests and key stakeholders to build and strengthen relationships, collaborate on projects, participate in decision-making, and foster a sense of place and inclusiveness year-round for the city of Vlore which could in turn have benefits for the broader poltical policy and strategy of Albania. The hubs have been designed in a way that allows them to be used as gathering places for parties, special events, fund raisers, political campaigns, and potential community projects.

The municipality of Vlore actively working towards the same meeting local and native goals in order to ensure a timely transition into a new era for the city and the country. The development of suvch a project would allow to advance projects that reduce GHG emissions while also reducing risk and vulnerability, and enhancing equity.

The Lifeline would greatly impact the community of Vlore and all those that constitute Albanias foray into a prosperous and sustainable era.

POLITECNICO
MILANO 1863

THE LIFELINE

A Sustainable Regeneration of Vlorë, Albania